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THE AMERICAN
JOURNAL OF PHARMACY

VOL. 98 OCTOBER, 1926 No. 10

EDITORIAL

THAT DEFINITION IN REMINGTON'S

"PHARMACY"—so Remington wrote—"is the science which treats of medicinal substances. It embraces not only a knowledge of medicines and the art of preparing and dispensing them but also their identification, selection, preservation, combination, analysis and standardization."

And it had been our privilege that very morning to dissect and expound this definition to a class of young people, just entered upon their collegiate work in pharmacy. One surmised from their expressions that they fully relished the dimensions of the definition, and that if this was pharmacy—indeed they were proud to be of it and in it.

But in the teacher's mind were certain inexpressibles—purposely reserved so not to spoil the picture.

For the definition in Remington looked better—seemed more inspiring and worthwhile when exhibited alone.

That very morning the teacher had read in a local paper the dismal tale of a cainish group of practitioners of pharmacy whose establishments had been "successfully" raided by Prohibition Unit No. 1. *And* THAT *might have spoiled the picture.*

He remembered also that a *pharmacy* (!) just around the corner no longer compounded prescriptions, if it could evade that responsibility—for it had found the sundry department more profitable. In which decision is no doubt an element of public safety. *And* THAT *might have spoiled the picture.*

Yet *this* morning of all mornings—for the teacher himself—even these and many other things, could not have spoiled the picture.

For the realism of it, and the comprehensiveness of it had come to him in a most appealing way.

The only little daughter of his house, just a few days before, had tossed about in the wicked fever of scarlatina, that dread disease whose hidden scars are so abiding. And the doctor and the little white nurse had come.

After the customary preliminaries the doctor had written down on a slip of white paper what probably represented the expression of his experience and judgment as the most potential weapon to assist the little lady in her fight against the wicked bug invasion.

—And no one questioned the doctor's judgment in the matter of his choice of weapons. His reputation as a good judge had long since been established.

But we did *wonder* just who might be entrusted with the work of compounding that prescription.

For years our family druggist had been *us*. But now in the emergency there was need of someone else.

And how did we fix our choice?

Certainly—not by sending that prescription to the chain store, whose prescription service is widely advertised as being economical, first, and reliable afterwards. Certainly—not by entrusting it to the drug store that prided itself in its vast assortment of soups and sandwiches.

No indeed! that medicine was intended for *our* sick little girl—and it was sent where we were *confident* that it would be compounded of properly "identified, selected, standardized and preserved drugs." We wanted to have assurance that every drop of the tincture of aconite requested by the physician would be exactly as he expected it—a potential minister of relief to our suffering little lady. We wanted to be convinced that it went to an establishment practicing the pharmacy of Remington's.

And our choice must have been well made, for the medicine apparently did exactly what it was intended to do.

To us the man who compounded that prescription seemed quite as necessary to the picture as the man who wrote it. His sense of obligation to a code of honor—and his responsibility to society—we considered to be in no wise less than those of the prescriber.

More power—to the definition in Remington's—and to the pharmacist who compounds his medicines—with as much care and skill and honesty as if every separate one, no matter how humble its mission in therapy, was designed for a loved member of his own family, or for someone wrapped up in his heart.

IVOR GRIFFITH.

BASIC REFORMS

AN INTIMATE intermingling of nations has been brought about by the development of radio, aviation and improvements in steamship, railroad, bus and private car. The differences of language, standards of currency, weights and measures and methods of time-keeping have become strongly evident and some movement has been already started to secure greater uniformity in these matters. Most civilized nations have followed the example of the United States and adopted a decimal currency. Great Britain and her antipodal colonies are the only important exceptions. With an obstinacy worthy of a better cause that great nation persists in the awkward and time-consuming system of pounds, shillings and pence. In the matter of weights and measures, most nations have also followed the decimal system of France, but the United States, Great Britain and the colonies of both nations still hang back and deal in pounds, ounces, gallons and other troublesome units of the ancient system. The confusion is much greater in this field than in that of coinage, for the British currency units are so distinct in name and value that they are thoroughly earmarked. In the field of weights and measures, "pound" and "gallon" have two significances, while for the smaller fry, ounces, drams, etc., the confusion is much greater. The scientists of both countries have happily broken through this conservatism; in laboratories we are not bothered with the distinctions between the imperial and wine gallon or between the troy and avoirdupois pound. An earnest and well-organized propaganda for introduction of the decimal system in the United States and Great Britain is now being carried on, and there are some hopes of its being at least partly successful.

It is, however, worth while to give some attention to two other basic reforms that are attracting much attention, though one has not yet come out of the speculative field. These relate to reform in the calendar and the establishment of an international language. The main facts in the history of our calendar are well known. The first "kaiser," who "came, saw and conquered" in peace as well as war, established the length of the year according to the best information he could obtain. For his own glory he changed the name of the month *quintilis* to *Julius*. His successor, upon whom the flattery of the Senate conferred the title "Augustus," wanting also a month, changed *sextilis* to *Augustus* and added to it a day from February in order that August might be as long as July. Thus summer vacation-

ists get an extra day. The Julian calendar served the civilized world for centuries, but the slight want of adjustment of the year with the earth's orbital motion, caused the seasonal holidays to be steadily thrown out of line with seasonal conditions. A ruler who had much authority, though not as absolute as Cæsar, reformed conditions so that the present calendar will serve for many centuries without serious dislocation of seasonal dates and conditions. The Gregorian calendar was adopted promptly by the nations under Papal authority, but others were slow, and it was not until 1752 that Parliament by an act ordering that the day following September 2 of that year should be the 14th brought Great Britain and its colonies into agreement with continental nations. The Julian calendar was retained by the nations under the Greek church until recently. Islam and Judiasm have calendars based on lunar periods. The former is not adjusted to the true year and consequently the fasts and feasts of that church move in the course of centuries through the seasons. The Jewish calendar is kept in approximate conformity by the occasional insertion of an extra month.

For some time suggestions of a rather revolutionary change of the calendar have appeared. The main motives have been to get rid of the irregularity of the months and arrange them so that certain important days will always fall on the same day of the week. One of the simplest plans is to have thirteen months of twenty-eight days each, which would leave one day over for ordinary years and two days over for leap years. The excess day in ordinary years would be New Year's Day as a *dies non,* and the extra day in leap year could also be so considered. Such an arrangement would make the complicated calendars unnecessary. The French Revolutionists tore up the Gregorian calendar by the roots, dividing the year into twelve months of thirty days each, with five extra days called "complementary" officially, but commonly known as the *"sans culottides,"* "the days without trousers." Much disturbance of business would probably occur at first if marked change in the calendar should be made and the difficulty of getting international agreement will be very great.

The effort at establishing an international language has received more attention of late years than in any former period, although such suggestions have been very frequently made. Probably more than a hundred languages have been proposed. One favorite plan was to make Latin grammar much simpler, making, for instance, all declensions and conjugations regular, but this involves more difficulty than

appears at first sight. Esperanto, which is a recent addition to the group, has secured considerable vogue. Scholars of many nations have adopted it. It would, of course, be better if some established tongue could be chosen, but national antagonisms will prevent the adoption of any tongue spoken by a nation of importance, since it will be universally recognized that such use will give to the nation to which the language is native a vast advantage in world affairs. Some nation that has a well-developed and comparatively simple language, especially if the pronunciations are closely in accord with spelling (the serious objection to English) and the nation itself is not regarded as a competitor for world power, would be the most satisfactory. Under these conditions, Spanish seems to be the most promising. Spain is out of the race for world control. Spanish is comparatively simple in syntax and as phonetic as a living language can be. It has but few unusual sounds and few accented letters, and even these could doubtless be avoided to a great extent. Though not spoken by any influential nation, it is the language of the greater portion of South America. There is little doubt, however, that an attempt to make Spanish an international language would meet with violent opposition from Brazil, in which Portuguese is the official language.

HENRY LEFFMANN.

ORIGINAL ARTICLES

THE PHARMACOGNOSY OF CEANOTHUS AMERICANUS*

By E. H. Wirth, Chicago, Ill.

THE ROOT and root bark of Ceanothus americanus L. have found employment as astringents in many ways, their original usage probably dating back to the Cherokee Indians. Other parts of the plant such as leaves, etc., have also been used locally and internally in ulceration of the mouth and in dysentery. Its therapeutic properties in these cases were usually ascribed to the tannin, present practically in all parts of the plant. During both Revolutionary and Civil

*This study was undertaken at the request of Guy. C. Taylor, Chief Chemist, of Flint, Eaton & Company, Decatur, Illinois. Mr. Taylor has supplied entire plants in the flowering and fruiting stage collected in North Carolina, as well as several commercial samples of the root bark.

Wars an infusion of the leaves was used as a substitute for tea. The plant has recently become of especial interest due to the discovery of new therapeutic properties. Taylor working with an extract of the root bark and with the alkaloids extracted therefrom has shown the drug to have marked coagulative properties when administered orally.

Groot reports an average depression of 41.8 per cent. in coagulation time in one group of thirteen pathological cases. He used an extract of the drug and a solution of the purified alkaloid. Tharaldsen has discussed the blood reactions of the drug and confirms the work of Groot on coagulation. Payne cites 235 cases in which he has used the extract of the drug preoperatively to hasten coagulation and to control hæmorrhage. Clark has determined that the alkaloids from the root bark, recently isolated by Taylor, are present as a complex mixture. He was able to isolate one crystalline alkaloid and also briefly reports an interesting resin-like substance. The recently discovered therapeutic properties are supposedly due to the alkaloids. A search of the literature has revealed no pharmacognostical study of the drug and it was suggested that such a study would be of interest.

The Plant

The plant is a member of the Rhamnaceæ, the genus Ceanothus including about fifty-five species native of North America. Ceanothus americanus is found in dry woods from Maine to Ontario, Manitoba south to Florida and Texas. It is particularly abundant in the Atlantic Coast States, especially in the mountainous regions. In North Carolina it ascends over 4000 feet. A closely allied species, Ceanothus ovatus, is found growing in rocky places and prairies from Vermont and Ontario to Minnesota, southward through Illinois to Texas. This species is rare or absent in the Atlantic Coast States. It differs from C. americanus in being smaller and having lanceolate, pubescent leaves. The more common names for Ceanothus americanus are New Jersey Tea and Red Root, it also being known as Jersey Tea, Walpole Tea, Mountain Sweet, Wild Snowball, Wild Pepper, Spangles and Bohea.

The plant (Fig. 1) is shrubby, attaining the height of about one meter. The stems are erect or ascending, several commonly arising from the crown of the root. The stems rarely exceed 1 cm. in diameter and give off alternate branches. The leaves are alternately arranged, ovate or ovate-oblong in shape, from 3 to 8 cm. long and 1 to

3.5 cm. broad, with acute or accuminate apex, sharp and finely serrated margin and obtuse, occasionally slightly cordate base. The petioles are slender and about 1 cm. long. Both surfaces are somewhat minutely hairy, especially near the veins, the principal veins being slightly depressed on the upper surface. Three primary veins arise from the petiole, one central one terminating in the apex, and

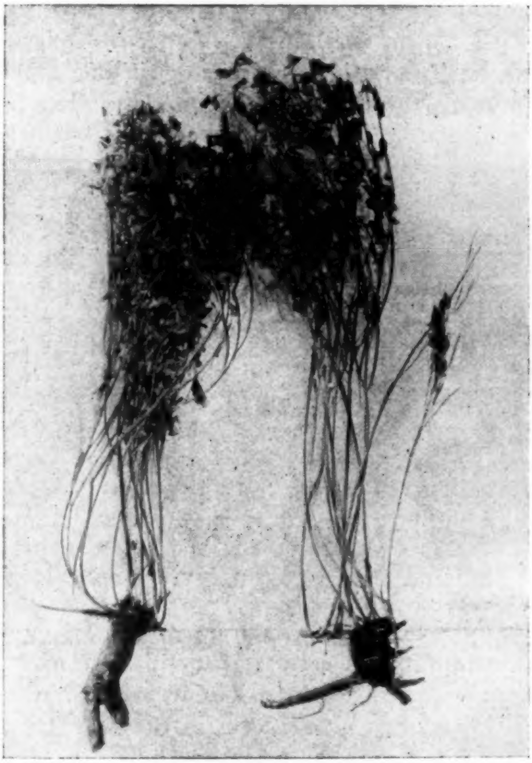

Figure 1—Ceanothus americanus. Entire plants collected in North Carolina.

two located almost parallel to and about equidistant between this central one and the margins on either side. These latter terminate in the margins about one-fourth the distance from the apex. Secondary veins arise from both sides of the central vein and are confined mostly to the upper half of the leaf. The secondary veins arising from the two primary veins located on either side of the central one

are confined almost entirely to the marginal sides of these veins. (See Fig. 2.)

The flowers are found on leafy shoots of the same year, the peduncles arising either terminally, or more usually, in the axils of the leaves. The peduncles are often as long as 15 cm., being minutely hairy and bearing occasional small leaves near the top. The

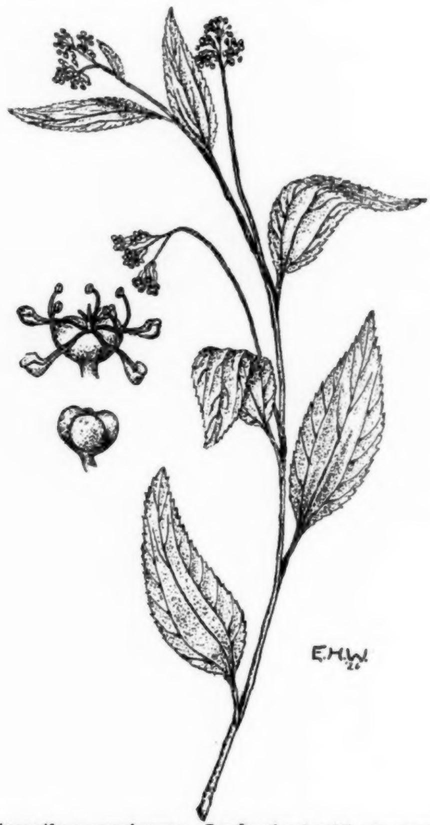

Figure 2—Ceanothus americanus. Leafy shoot with unopened flowers. Flower and fruit.

small white flowers occur in oblong clusters arranged in coryombs or panicles at the terminus of the peduncle, with an occasional cluster arising from the axil of one of the peduncular leaves. The flowers are perfect with hemispheric or top-shaped calyx tube having a five-lobed limb. The pedicels are from 5 to 10 mm. long and nearly white in color. The calyx is likewise nearly white in color. The five petals

are hooded, clawed, longer than the calyx lobes and inserted under the disk. The claws of the petals are very narrow. There are five stamens with filaform, elongated filaments. The three-lobed ovary is immersed in the disk being adnate to it at the base, the disk in turn being adnate to the calyx. The style is very short and three cleft.

The fruit is depressed, nearly black and about 2 or 3 mm. high. It is three-lobed, separating when mature into three nutlets. The albuminous seed has a smooth testa, fleshy endosperm and the cotyledons are oval or ovate.

The root exhibits a very gnarled, twisted and somewhat knotty crown and attains a length of from 20 to 50 cm. and a diameter up

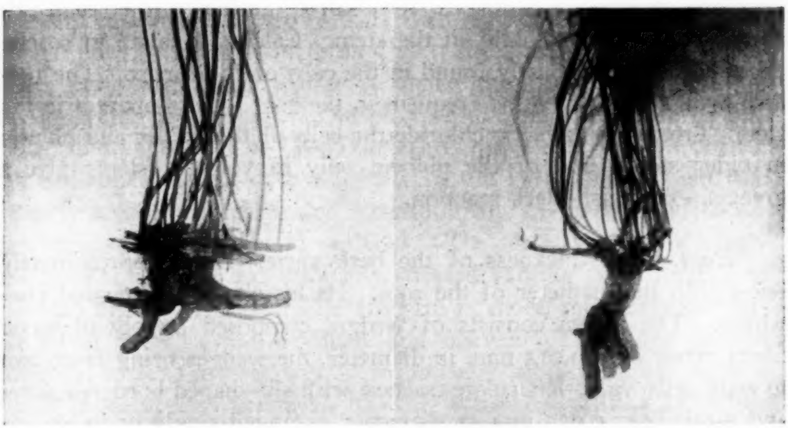

Figure 3—Ceanothus americanus. Photograph showing typical roots with attached stems.

to about 5 cm. It is frequently branching, the branches rarely being over 3 cm. in diameter and are usually more or less curved and twisted. (See Fig. 3.)

Histology

The important histological features of the plant are briefly as follows:

Stem.—The bark of the stem is much thinner than that of the root, its thickness in mature stems being about one-twentieth of the total diameter. Stems up to five years old bear a layer of epidermis with thick outer cuticle. In the leafy shoot some of the epidermal cells are modified into short, curved, rather thick-walled unicellular

hairs up to 0.100 mm. long and 0.015 mm. wide at the base. In older stems (three to four years) cork is beginning to form especially near the stomata. The cortex consists of about eight rows of rather thick-walled, tangentially elongated, more or less collenchymatous cells and bears on its inner side (even in very young stems) a pericyclar layer of very slightly lignified bast, which is accompanied on its inner side by an occasional group of lignified stone cells. Inwards of this is a narrow phloem region. The xylem is entirely lignified, the xylem wedges consisting of thick-walled wood fibers interspersed with many tracheæ rarely over 0.050 mm. in diameter. The medullary rays are mostly one cell wide and frequently over fifty cells deep. The pith is composed of large thin-walled isodiametric cells, an occasional one near the xylem containing a few starch grains. Other than this starch is practically absent in the stem. Calcium oxalate in rosette aggregates is occasionally found in the cells of the cortex. The reddish-brown cell content so frequent in the root is not apparent in the stem. Treated with ferric chloride the cells of the cortex and phloem in older stems, and of the phloem only in younger stems give a greenish- or bluish-black reaction.

Root.—The thickness of the bark varies, being approximately one-eighth the diameter of the root. Its histology is discussed elsewhere. The xylem consists of wedges composed largely of wood fibers rarely over 0.015 mm. in diameter, the wedges being from two to eight cells wide. Reticulate tracheæ with slit-shaped bordered pores and rarely over 0.075 mm. in diameter, arranged singly or in groups of two or three occur at intervals in the wedge forming collectively the ring of growth. The wedges are separated by medullary rays one to five (rarely more) cells wide. The ray cells as seen in transverse section are much larger than the fibers. They are square or rectangular, being elongated radially except near the cambium, where they are somewhat tangentially elongated. The cells have porous walls and contain considerable starch usually in single grains from 0.005 to 0.015 mm. in diameter. Occasional cells are filled with a brownish substance, the color of which is intensified by the addition of hydrochloric acid. In sections mounted in ferric chloride the brownish substance acquires a blackish color. The walls of all cells in the xylem are lignified. Tangential sections show the rays to be very deep, the groups of fibers and tracheæ travelling in long, irregular, sweeping curves between the rays.

Leaf.—Nothing exceptionally characteristic is apparent in the histology of the leaf, except the presence of trichomes. These are non-glandular, somewhat curved, rather thick-walled and attain a length up to 0.600 mm. They consist usually of one and occasionally of two cells. On the average the leaves are about eight to ten cells thick, showing besides the two epidermises one or two rows of pallisade near the upper surface, the rest of the mesophyll consisting of loosely arranged chlorenchyma.

The Drug

Description.—The root bark of Ceanothus americanus occurs in transversely curved pieces or in short quills, being from 1-3 mm. thick. Occasional pieces from the crown may be thicker. While occasional pieces may be as long as 5 or 6 cm. and one or more centimeters wide, the usual length is under three centimeters with an average width of 5-6 mm. The pieces are frequently more or less twisted and curved. The outer surface is grayish to reddish brown, with a distinct pinkish cast especially in the furrows. The surface is nearly smooth to rough and longitudinally furrowed, with occasional transverse ridges and furrows. The inner surface is nearly smooth to rough and longitudinally striated varying from reddish to yellowish brown in color. The fracture is short, the fractured surface being more or less granular and uneven. The outer portion (cork and cortex) are reddish brown in color, while the inner bark is usually more or less yellowish brown. When cut with a knife the cut surface exhibits a waxy appearance. The bark is odorless, but has a bitter and astringent taste. Figure 4 illustrates more common specimens of the bark.

Structure.—Cork of variable thickness (average about 15 cells) was found on all barks examined. The cells as seen in transverse section are usually tabular (tangentially elongated) about 0.020 mm. long by half as wide, but occasionally approach an isodiametric shape. The cells are filled with a dark reddish-brown substance, the cell walls exhibiting a similar color.

The cortex is rather narrow varying in width from 10 to 30 cells. The parenchyma cells as seen in transverse section are mostly more or less oval or rectangular in shape and tangentially elongated. Several of the cells especially those in the outer portion of the cortex contain a reddish-brown substance. Occasionally cells very much

elongated tangentially are found in the outer portion of the cortex. These frequently are also filled with the reddish-brown substance. Rosettes and occasionally prisms of calcium oxalate are found. Starch is rare in some specimens and abundant in others. Interspersed throughout the cortex are small groups of lignified stone cells.

The phloem region is very broad especially in older barks. The phloem patches themselves are quite narrow, collapsed sieve being seen in the inner portion of the region. The medullary rays are from one to eight cells wide, the cells being usually elongated tangentially, but in occasional cases, especially in older and thicker barks, are sometimes radially elongated. The ray cells frequently contain the

Figure 4—Ceanothus americanus. Typical specimens of root bark. The second from the left shows the inner surface.

reddish-brown substance, and may also contain starch and calcium oxalate. Throughout the phloem region are scattered several groups of stone cells. The groups are usually tangentially elongated and include often fifty or more cells, frequently crossing two or more phloem patches and their separating medullary rays. The stone cells are isodiametric or slightly elongated longitudinally, lignified, and have walls of variable thickness exhibiting simple pores. The shapes of the cells resemble closely the type of cell from which they were formed (phloem or medullary ray).

An interesting feature exhibited only by older and thicker barks is the lignification and wall thickening of certain of the phloem cells. Often a strip about 10 to 15 cells wide running tangentially and lo-

cated about centrally or in the inner portion (not the extreme inner portion) of the phloem region shows thickening and lignification of

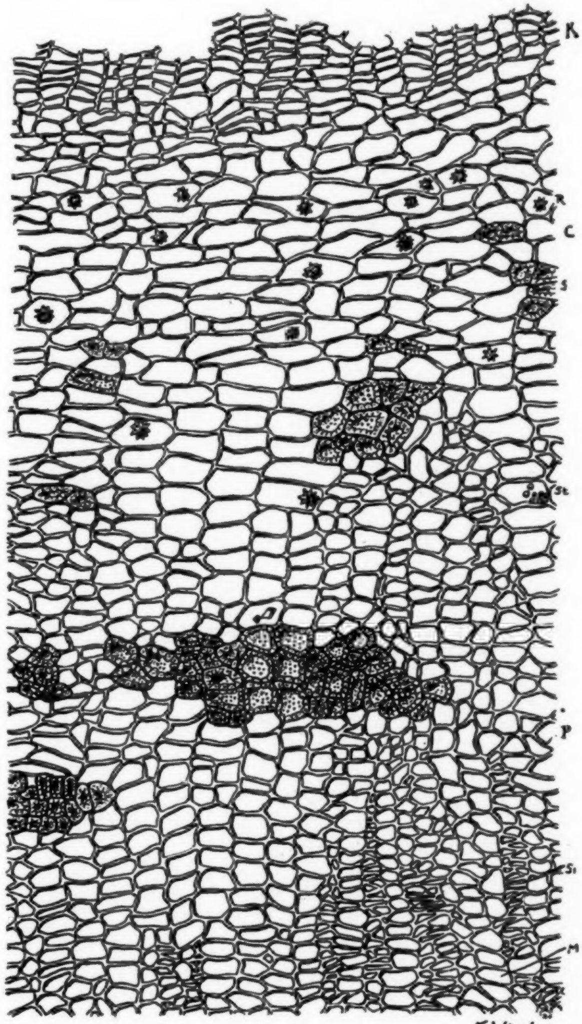

Figure 5—Ceanothus americanus. Transverse section in the root bark representing an average specimen of somewhat younger bark. K cork, C cortex, P phloem, S stone cells, Si sieve, R rosettes of calcium oxalate, St starch, and M medullary rays.

the walls of its component cells. Figure 6 illustrates an older bark exhibiting such a thickening, while Fig. 5 illustrates the normal aver-

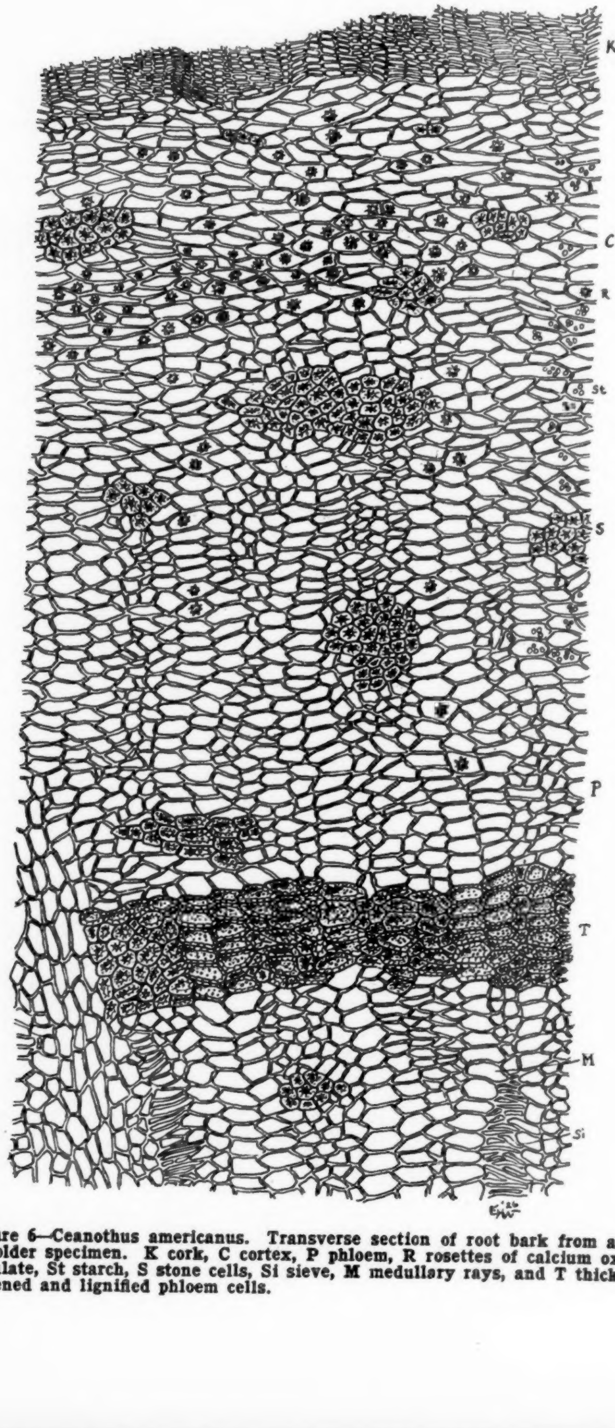

Figure 6—Ceanothus americanus. Transverse section of root bark from an older specimen. K cork, C cortex, P phloem, R rosettes of calcium oxalate, St starch, S stone cells, Si sieve, M medullary rays, and T thickened and lignified phloem cells.

age younger bark. Increase in thickness of the bark is due almost entirely to the formation of new cells in the phloem region, the cortex increasing but slightly in thickness.

Cell Contents.—Gerlach in an analysis of the drug made in 1891 reports 1.87 per cent. starch and 0.52 per cent. calcium oxalate. Starch occurs abundantly in some specimens and sparingly in others, as a rule being more abundant in thicker barks. It is found in the cells of the cortex and medullary rays and occasionally in the phloem parenchyma. The grains are mostly simple and occasionally up to three-compound, from 0.002 to 0.012 mm. in diameter. Calcium oxalate occurs in all specimens of the bark, being found usually in the cells of the cortex and sometimes in those of the medullary rays. It exists mostly in rosettes up to 0.035 mm. in diameter with an occasional prism within the same size limit.

Many of the cortical cells and often several ray cells contain a reddish-brown or orange-brown substance, whose color is intensified upon the addition of hydrochloric acid. This substance may be the "resin" which Clark mentions in his recent work. Treated with ferric chloride solution some of this cell content assumes a bluish-black color. While this blue-black reaction is seen in the large majority of xylem cells containing a brownish content, its occurrence in similar cells in the bark is not so frequent, only a portion of the cells containing the brownish substance giving the reaction. This would indicate that the content of these cells is not uniform and probably often consists of more than one substance. Whether the ferric chloride reaction is due to the presence of tannin or due to the reduction of the ferric chloride by alkaloid has not been determined specifically, but indications seem to point to the fact that it is probably due to tannin. The cell walls of practically all the cells in the bark assume a dark color when treated with ferric chloride and with ferric ammonium sulphate, the reaction being probably due to tannin.

Attempts to show the location of the alkaloid in the bark have given by no means conclusive results. Clark has shown that the alkaloid or mixture of the alkaloids gives a decided yellow color with concentrated hydrochloric acid, and a green with sulphuric acid-potassium dichromate mixture due to the reduction of the dichromate. Sections prepared from specimens previously softened in slightly alkaline water so as not to lose the alkaloid and treated with concentrated hydrochloric acid gave a decided yellow color to the stone cells and other lignified tissue. Similarly prepared sections gave a greenish color in the stone cells when mounted in sulphuric acid-potassium dichromate mixture, both reactions taking place in a

very few minutes. This would seem to indicate that the alkaloid was located in the stone cells.

Attempts to crystallize one alkaloid in the section did not give satisfactory results. Picric acid was used in various ways, but gave no conclusive results. By soaking dry specimens of the bark in alcoholic picric acid, the writer was able in one case only to obtain crystals which might have been those of an alkaloidal picrate. These crystals occurred in a few of the medullary ray cells containing also the reddish-brown substance. The writer hopes to continue work in this direction with the end in view of establishing the location of the alkaloids in the bark.

Powder.—The powder is light reddish brown in color and shows the following characteristic elements. Starch and calcium oxalate which have been previously described. Isodiametric or slightly elongated stone cells in more or less broken groups, exhibiting lignified porous walls of variable thickness, the individual cells being up to 0.075 mm. in size. Fragments of cortical or medullary ray parenchyma frequently brownish in color. Brownish tabular or isodiametric cork cells. Xylem tissues finding their way into the powder by wood adhering to the bark, were practically absent in several commercial samples of powder examined.

Summary

The plant Ceanothus americanus has been described botanically with brief mention of the histological features of the root, stem and leaf. The root bark, comprising the drug, has been described macroscopically and microscopically. The histology is discussed together with the cell contents present. A brief description of the powder is given.

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Pharmacognosy Laboratory, University of Illinois,
School of Pharmacy, Chicago.

IMITATION OF LIFE *

By Arno Viehoever, Ph. C., F. C., Ph. D.

Director of the Biological and Microanalytical Laboratories, and College Experimental Gardens

We 'tempt to trump the genius of nature's deed,
Yet have to learn to imitate—before we lead!

WITH Biologist Harris we believe that two things are worth much in the world today: one is love, the other thinking a new thought, a really new idea. With Professor Lotka, of Johns Hopkins University, we claim that the world needs today more of the optimism of the progressive, more faith in creative evolution, more hope of reaching still higher levels of achievement, more freedom from prejudice, a passion for productive work—more hunger for action, more thirst for accomplishment.


Arno Viehoever

Where is there any more fascinating subject than life,—a more thrilling experience than following man through the ages, trying to understand life, its nature, its origin and meaning!

Where is the one who, in the face of the constant progress made in man's control of life,—would bid us stand still in fear or resignation; who would limit man, before he has brought to play all his resources, to engineer life? Who would crush his earnest attempt to build up life-giving substances, if not life itself? Who would condemn his courage, in imitating, one after the other, the life functions,—in order to thus finally solve the mystery—the riddle of the universe—"Life."

We adopt Tennyson's words: "Men, my brothers, men the workers—ever doing something new. That which they have done but earnest of the things that they shall do."

*One of a Series of Popular Science Lectures presented at the Philadelphia College of Pharmacy and Science, Season 1925-1926.

1. Meaning of Life in the Universe

I. The Eternal Miracle—Life

Life, like time, is hard to define; it represents the sum total of processes in living organisms—plants and animals alike. These everyday life processes are extraordinarily complex. We see life all around us, invading and surviving everything. It is carried on, (as we have pointed out in our previous lecture on "Control of Growth"†) by small organized units, the cells and smaller physical as well as chemical units. All living cells contain protoplasm, a whitish translucent jelly, evidently similar in all kinds of creatures. We know of important elements, composing the protoplasm, and keeping it alive.

As every process in the world, life is determined by the regulation of all conditions. Of the general outer life conditions, the medium, we recognize the importance of substance supply (food, water, oxygen), of energy supply, of static and osmotic pressure (demonstrated later—in artificial cell) (see Figure 3 i), and of temperature. Temperature, states Dr. McDonald (University of Pennsylvania), determines the degree of complexity of the material of life, and the hydrogen-ion concentration (p. H.)‡ also has an influence. Life can only exist within limited ranges of these factors. The hydrogen-ion concentration of the blood plasma in the human bodies varies according to his findings from 7 to 7.9. Health depends on the maintenance of the proper p. H.;—variations cause disease; no life is said to be possible at p. H. 14, a very alkaline medium. For many organisms and especially plants, light must also be available. As general inner conditions, we recognize the importance of chemical compounds organic—as proteins, carbohydrates and fats; inorganic—as salts of elements and especially water. The inner physical conditions for life, intimately connected with the chemical, constitute the liquid consistency due to the presence of water (60-80 per cent. of entire mass of all living substances), the colloidal and electric ability of substances and their solutions. The inner morphological conditions for life are observed as inner cell structure, net or foamy structure of the protoplasma—emulsion, and the peculiar net or filament-like arrangement of the nuclear—and chromatin substances. (See Figure 1.)

†Arno Viehoever: "Control of Growth in Plants and Animals," in *Popular Science Talks,* Vol. 3, pages 198 to 217.

‡Ions, according to Arrhenius' theory of dilute solutions, are electrically (plus or minus) charged atoms or group of atoms—obtained through "dissociation" of the molecules. The hydrogen ions have a positive charge.

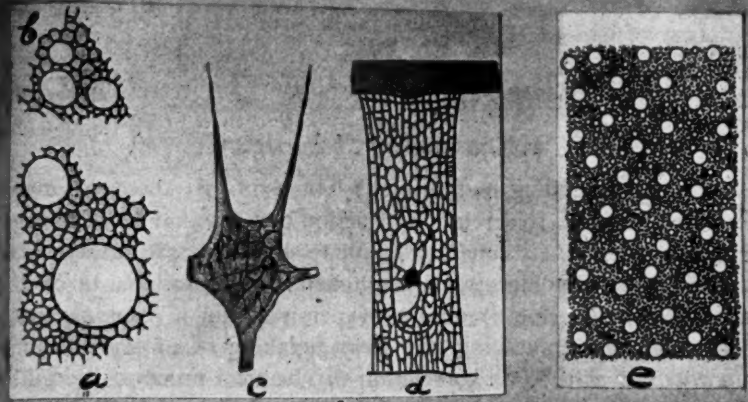


FIGURE 1

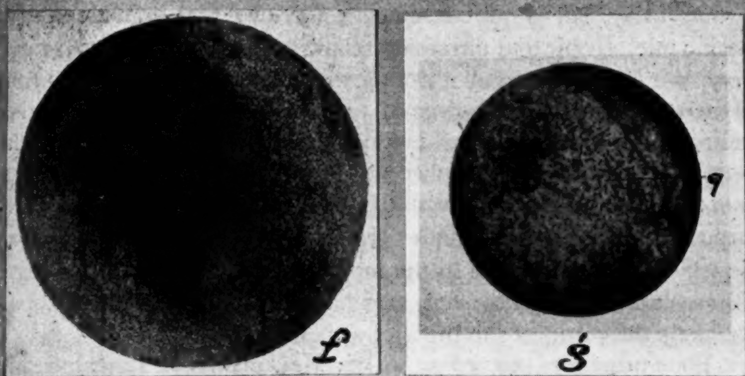


FIGURE 2

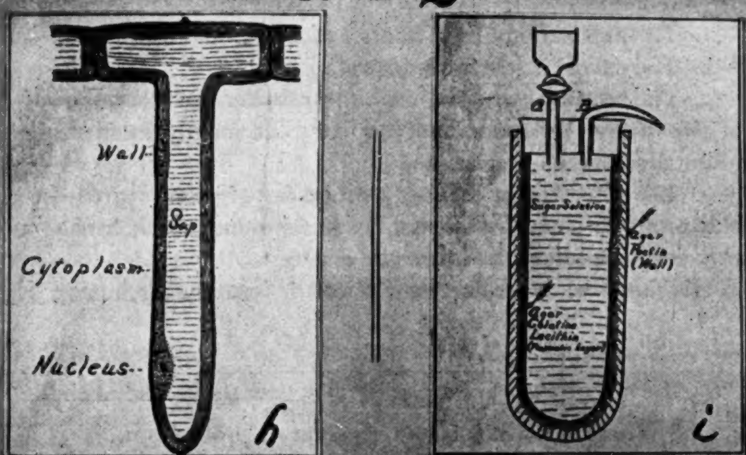


FIGURE 3

Figure 1—(a) Foamstructure of protoplasm of Thalassicola (Prctozoa);
(b) foam of olive oil and cane sugar;
(c) protoplasm of pseudcpode of Miliola (Forminifera);
(d) protoplasm of epidermis of earthworm (after Buetschli);
(e) diagram of an emulsion—illustrating physical protoplasm structure (after Shull).

Figure 2—Fossil Bacteria (f) cocci (streptococci?) from limestone (x 1100, after Walcott); (g) rods (bacillus ozodeus), on fernsporangium silicified (x 300, after Renault).

Figure 3—(h) Cell of planthair; (i) artificial cell (after McDougal).

2. *Outstanding Characteristics*

Living, according to Professor Thomson, of Aberdeen, may be described as a two-fold relation of action and reaction between organisms and their environment. Animate creatures are always active towards two main aims: self-maintenance and continuance of their race. We evidence (1) ability of persisting in a complex specific metabolism, the upbuilding and down-breaking of protein-substances in a colloidal state; (2) correlation of chemical processes permitting of continued existence—in spite of ceaseless change. "It is always burning away, but is not consumed"; (3) chemical individuality and specific microscopic and ultramicroscopic architecture; (4) capacity to grow, not like a snowball through mere accumulation, but through active assimilation; (5) power of reproduction, spontaneous division leading to the origin of new individualities; (6) faculty of development, the realization of the inherent diversity of the cell or tissue fragment; (7) the quality of effective behavior (correlation, individuality, purposefulness) exhibited under various conditions; (8) the property of profiting by experience in the individual lifetime and from results of ancestral experiments; (9) variability, a gift of the organisms,—and likely the germ cells to produce something new.

Four principles, according to Dr. McDonald, are fundamental in the study of man's life:

1. The application of the energy of life from atoms;
2. The colloidal structure of protoplasm;
3. The control exercised over the relation and processes of the first two factors by a special group of cells mainly localized in the involuntary nervous system, and
4. The effect upon the body processes of man's particular and peculiar physic power of mentality and emotion which he has more highly developed than the other vertebrates.

His tentative, necessarily complicated, formula for human life is

$$\frac{\mathrm{B\,H\,CO_3} \times \mathrm{OH} \times \mathrm{Sr.} \times \mathrm{Es.}}{\mathrm{K\,H_2\,CO_3} \times \mathrm{H} \times \mathrm{So.} \times \mathrm{Ev.}}$$

Where K = the protein constant of protoplasm,
$B\,H\,CO_3$ = the fixed alkali of univalent cations,
H_2CO_3 = the fixed acid of bi- and tri-valent cations and anions.
OH = the free hydroxyl ion,

H = the free hydrogen ion,
Sr. = the reduction poise or balance, according to Mansfield Clark,
So. = the oxidation poise,
Es. = sympathetic or autonomic nerves producing emotions,
Ev = vagus, most widely distributed nerve, producing emotions.

Inasmuch as lipoid solvents are not considered in this formula, it will likely need changes.

3. Origin of the Animate Protoplasm

Speaking about creation, Professor Snyder, of Philadelphia, states "The interior of the sun and all heavenly bodies is an atom-making arsenal.

The sun, in a mighty explosion, hurled out the planet earth. The distant creation scenes re-echo the design and the generative mechanism which existed and still persists in our own little sun. The purpose of the design of the mechanism which brought forth the solar and satellite and star systems seems to be to build a system which shall be permanent and safe for the production and continuance of life."

The representatives of all branches of natural science agree that our earth has passed through various stages of development. Stone and metal now forming the rigid crust were molten masses, and this liquid center was surrounded by an atmosphere of gases. Life could only originate after these masses were no longer hot and water could exist on earth.

Life, according to Allen, in the evolution of the earth and its inhabitants, was of the humblest kind, since there were no definite organisms, only diffuse substances trading in energy—and between this state and the evolution of cellular organisms an immense period elapsed.

He suggests that the first organism was of the animal sort and of spherical shape, but that it gradually grew a tail or whip. It used this to come out of the deep regions to the sunny surface of the sea, where chlorophyll, the granules found in all green organisms, was acquired. In the presence of this green chemical compound the transformation of the carbon dioxide of the air and water into sugar and starchy substances likely was, as it is today, effected. The organism thus could make its own food.

The following suggestions are of special interest:

Certain bacteria, whose metabolism is based on the oxydation of ammonium to nitrites and nitrates, on iron, and sulphur and even hydrogen, derive their energy from these sources. They are thus independent of sunlight—a fact of the greatest significance in connection with the problem of the origin of terrestrial life as we know it today. For green plants, as we have seen, carry on their life business by the aid of chlorophyll, a substance representing a high degree of specialization, such as could not very well be supposed to exist in the most primitive life forms.

Osborn in his "Origin and Evolution of Life" states:

"In their power of finding energy or food in a lifeless world, the bacteria known as prototrophic or 'primitive feeders' are not only the simplest known organisms, but it is probable that they represent the survival of a primordial state of life chemistry. These bacteria derive their energy and their nutrition directly from inorganic chemical compounds; such types were thus capable of living and flourishing on the lifeless earth even before the advent of continual sunshine, and long before the first cholorophyllic stage (algæ) of the evolution of plant life. Among such bacteria, possibly surviving from archæologic time (see Figure 2), is one of these 'primitive feeders,' namely the *nitroso monas* of Europe. For combustion, it takes in oxygen directly through the intermediate action of iron, phosphorus, or manganese, each a laboratory, which contains oxidizing catalyzers, the activity of which is accelerated by the presence of iron and manganese. Still in the primordial stage, *nitroso monas* lives on ammonium sulphate, taking its energy (food) from the nitrogen of ammonium and forming nitrites. Living symbiotically with it is *nitro bacter,* which takes its energy (food) from the nitrites formed by *nitroso monas,* oxidizing them into nitrates. Thus these two species illustrate, in its simplest form, our law of the inter-action of an organism with its life environment."

Life, however, as we know it, is the product not only of certain chemical and physical forces, but also of heredity. If we believe in the theory of spontaneous generation, we must assume that the first living organisms somehow sprang into being without any hereditary characteristics at all—an enormous difficulty which has not been surmounted.

Some scientists, confronted with the difficulties to form the bridge between non-living matter and the earliest forms of protoplasm, have suggested the existence of a mysterious vital force different from any other known force and beyond human experimentation. Arrhenius proposed the theory that life was created in another hemisphere and

reached our planet in the form of fine dust. Free calls these opinions a lazy man's view. "It saves thinking by the simple expedient of removing the troublesome problem to the realm of the unthinkable; it merely carries the problem of life origin off to some distant world which we know nothing about."

Summary

Concluding the consideration of our conception of life, the evidence of an eternal adaptability, we point with Thomson to the *variety of life*—hundreds of thousands of distinct individualities or species; *the abundance of life;*—like a river always tending to overflow its banks; *the diffusion of life,*—exploring and exploiting every corner of land and sea; *the insurgence of life,*—self-assertive, persistent, defiant, continually achieving the apparently impossible; *the cyclical development of life,* ever passing from birth, through love, to death; *the intricacy of life,*—every cell a microcosm; *the subtlety of life,*—every drop of blood an index of idiosyncrasies; *the inter-relatedness of life,*—with myriad threads woven in a patterned web; *the drama of life,*—plot within plot, age after age, with every conceivable illustration of the twin motives of hunger and love; *the flux of life,*—even under our short-lived eyes; *the progress of life,*—slowly creeping upwards through unthinkable time, expressing itself in ever nobler forms; *the beauty of life,*—every finished organism an artistic harmony; *the morality of life,*—spending itself to the death for other than individual ends; *the mentality of life,*—sometimes widely awake; and *the victory of life,*—subduing material things to its will, and in its highest reaches controlling itself toward an increasing purpose.

I. The Inorganic Domain and the Organic Realm

II. Bridging the Gap—Imitation

As in the animate realm, so in the domain of lifeless things there is extraordinary diversity. Everything around us, states Enriques, is living and active save for a difference in degree, in the intensity or in the rapidity of the changes, and in the relative importance of the internal and external factors. The inanimate earth possesses many remarkable properties fitting it to house life. It is now generally agreed that laws govern both in the inanimate, as in the animate world. No room is left, says Thomson, for guidance or control other than is in the nature of things themselves. No room is left for intervention or influxes; the idea, that physical events were immediately ordered by

the hand of God in relation to human interests, disappeared like a dream. There came indeed to be developed an exaggeration of the omnipotence of the laws of nature—man's formulations of observed uniformities of sequence, which although they evidently approximate to reality, cannot be invested with absolutism. Yet the old order changed, giving place to a new,—the whole inorganic world is now more and more completely and consistently analyzed in terms of dynamics.

Similarly the body of living creatures is now recognized as the theatre of many chemical and physical operations. To realize the great and fundamental progress made in the last 100 years, I may quote here the view of Kant, the great philosopher, concerning the apartness of living creatures from chemical and physical laws: "It is quite certain that we cannot become sufficiently acquainted with organized creatures and their hidden potentialities by aid of purely mechanical natural principles; much less can we explain them; and this is so certain that we may boldly assert that it is absurd for man even to conceive such an idea, or to hope that a Newton may arise able to make the production of a blade of grass comprehensible, according to natural laws ordained by no intention; such an insight we must absolutely deny to man."

Another philosopher, Auguste Comte, said in 1849 or 1850 that there were two things that would never be discovered. The one was the origin of life; the other, the chemical composition of the stars. A couple of years later, two German students, Kirchhoff and Bunsen, did discover the latter, as a ray of dying sunlight, coming through a prism, unexpectedly wrote a hydrogen line on a sheet of paper used in spectrum experiments.

2. Synthesis of Life Substances

The study of physico-chemical processes going on in living organism has greatly increased our knowledge of vital products. The excretive product of the kidney, urea, was the first of organic substances prepared in the laboratory about 100 years ago by Woehler. Since then many substances, characteristics of life activity, have been synthesized,—nitrogen compounds, carbohydrates, fats, etc. The chemist is no longer limited in his scope, which constantly expands with increasing experimentation and broadened knowledge. He is accomplishing more than was ever expected from him. The manufacture of the complex mixture, protoplasm, however, is still beyond his reach.

3. Reproduction of Life Structures

The most recently published record of an artificial life structure is that of McDougal's artificial cell. This cell, resembling somewhat that of a planthair (see Figure 3 h), is prepared in the following manner:

Construction of the Cell

1. *A paper thimble*—one inch in diameter, three inches high, consisting of pure cellulose serves as an external cell wall.
2. *Agar*—Agar (seaweed) and pection from apple cores are dissolved in water into a thick brownish syrup. The thimble is dipped into this syrup and substance of sugar-like composition and jelly-like consistency are thus deposited within the meshwork of the cellulose.
3. *Alcohol*—into which the thimble is then dipped abstracts part of water and thus gives the thimble the desired physical structure.
4. *Gelatine and Agar*—Agar solution, in proper proportions and mixed with a small quantity of some fat, a litle soap, a minute trace of salt are included to represent actual condition in plant protoplasm, containing a very small amount of a great many substances.

   A layer of this still hot mixture, a quarter of an inch thick, is applied to the inner surface of the thimble and allowed to harden, representing the plasmatic layer.
5. A rubber stopper, with glass tubes appropriately fitted in, is inserted in the thimble.

A solution of sugar is poured in to represent the cell sap. The artificial cell is now ready for operation. (See Figure 3.)

Working of the Cell

The cell as described and completely filled with sugar solution is placed in a glass beaker containing either pure water or some salt solution. Water alone or water containing particles of salt will pass through the cell wall and into the sugar solution, causing the already filled cell to overflow through the tube. (B., Figure 3 i.) The amount of this overflow serves as a measure of the activity of the cell.

In the case of a living cell, McDougal states,—much is known of

its conduct in various salt solutions; what salts are allowed to enter, which ones are kept out and the speed with which each will act. Most of these facts have little rhyme or reason to them; they do not seem explainable by the known laws of chemistry and physics. When the solution, in which the cell is immersed, contains certain parts of salts, there is often a curious effect—antagonism. Whereby penetration of each salt is modified greatly by the presence of the other. This phenomenon of antagonism has been thought characteristic of protoplasm—no known property of the constituents of the protoplasm or the salts accounts for it. The interference of ions will prove a chemical and physical problem.

McDougal found that more potassium is absorbed by his artificial cell than sodium, the natural cell does the same, its selective absorption power for potassium being in fact twelve times greater than that of the artificial cell.

This artificial cell, McDougal concludes, is a much easier tool to work with than a minute living cell. Though presenting only a first short step and not altogether similar to an actual living cell, the artificial cell duplicates in principle certain actions for understanding life, it absorbs for a very short time food material and water with coincident increase in size—thus grows.

Copy of Life Functions

Ten functions, according to Roux, may be recognized in living organisms. These are capable of:

(1) The power of *absorption* of foreign substances;
(2) The power of *assimilation* — transformation in digestible substances;
(3) The power of *dissimilation* — modification; utilization of proteins and fats;
(4) The power of *excretion* of the modified substance, of carbon dioxide and urea, in animals, of oxygen in plants;
(5) The power of *preservation* through replacement without changing;
(6) Growth through accumulation of food substances;
(7) Movement—inner movement—reflex movement;
(8) Division and multiplication;
(9) Inheritance of characteristics to the offspring.
(10) Self-regulation through exercise of all single functions.

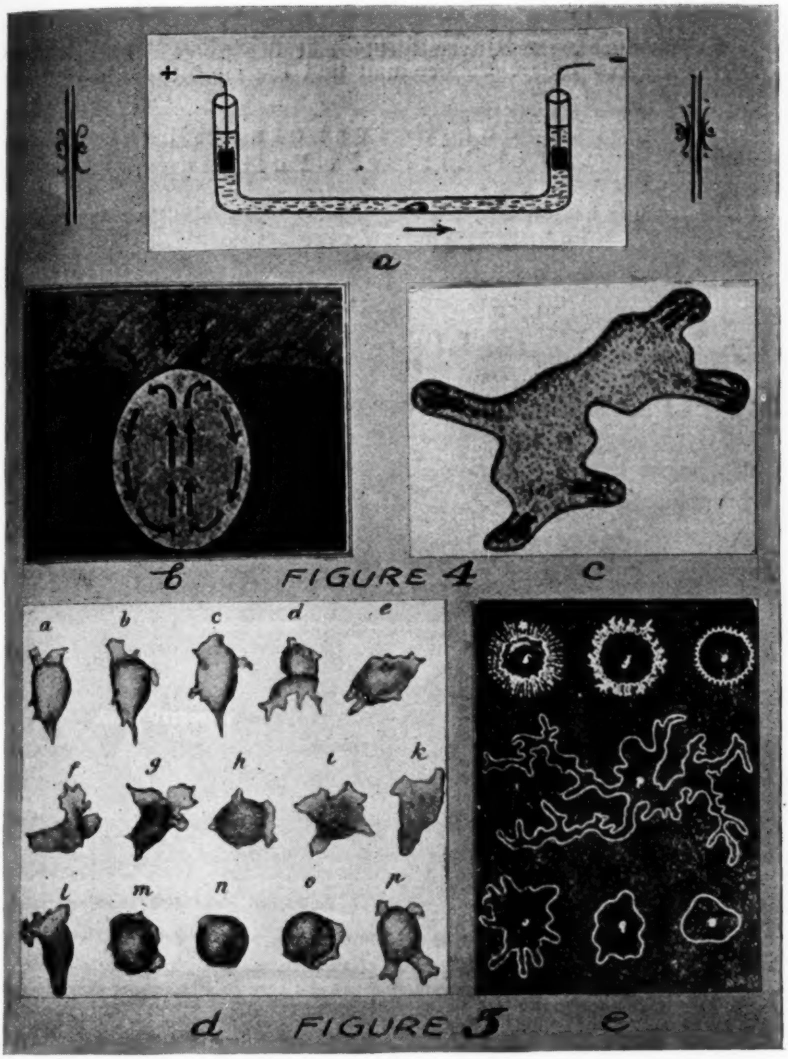


Figure 4—(a) Mercury drop moved by galvanotaxis like amoeba (after Krueger); (b) oildrop bordering on soap solution (a) and water (b); (c) drop of oilsoap foam in amoeboid motion (after Stempell and Koch).

Figure 5—(d) White blood corpuscle of frog, plasma motion through temperature change (after Engelmann); (e) olive oil expanding on weak sodium carbonate solution of varying concentration (after Verworn).

The following functions may be artificially reproduced:

1. *Movement:*

a. The movement of organisms in electric current may be imitated by mercury drops placed in a suitable water-filled tube permitting transmission of electric current. (See Figure 4 a.)

b. Protoplasm—a motion as found in the locomotion of the lowest one-celled animals—amœba—may be imitated with oil drop—soap

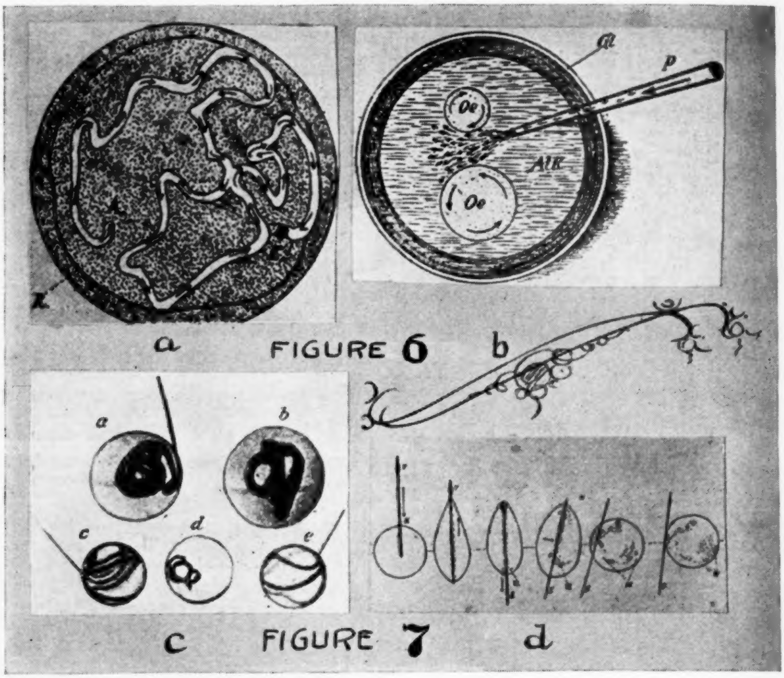


Figure (a) Chloroform drop lying in water on shellacked glass disk showing amoeboid movement from A to E;
(b) castoroil droplets in 80 per cent. alcohol set in motion by alcohol stream (after Rhumbler).
Figure 7—(c) Shellac filaments absorbed in choloroform drops;
(d) shellacked glass filaments absorbed and bare glass filaments expelled (after Rhumbler).

emulsion, with liquid crystals, or in other ways. (See Figures 4.C x c; 5.d x e; 6.a x b.)

This amœboid locomotion, the typical fountain motion and compared by Buetschli with the motion of emulsions, is due, to a principle of great importance, namely, the surface tension existing in oil drops bordering on one side on soap solution, or in drops of oil soap foam.

This oil soap foam is prepared, according to Yost, through mixing of thick olive oil with potash, and transferring the mass into water.

The soap first dissolved in oil goes into the water, which diffuses into the oil, and the aqueous soap solution is precipitated in form of finest

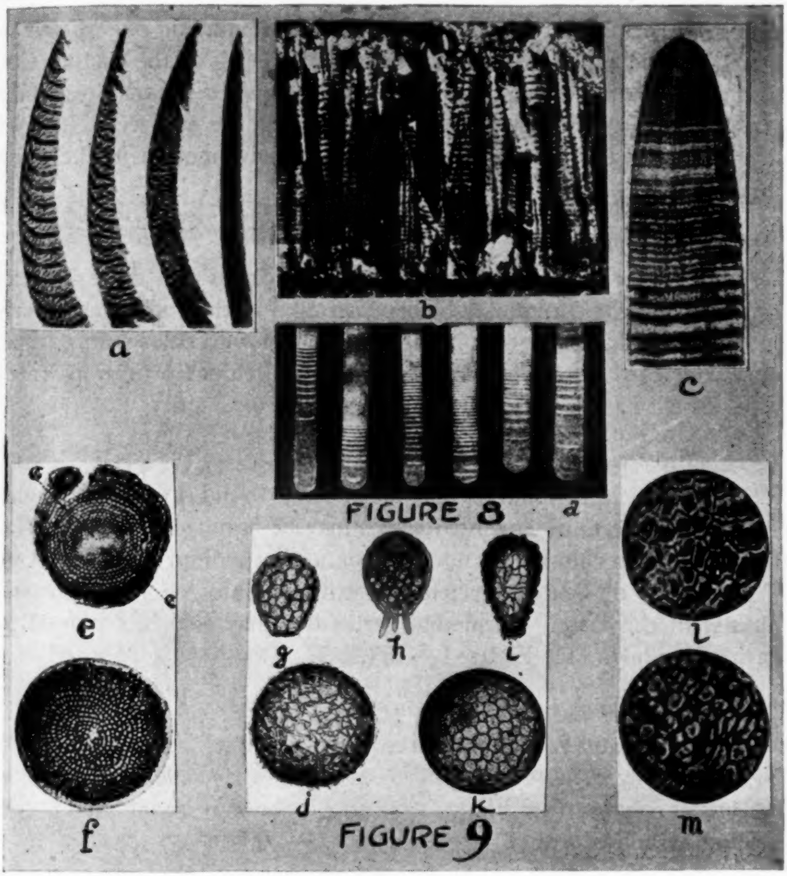


Figure 8—Rhythmic precipitation zones in
(a) Tailfeathers of fasans (after (Ghigi);
(b) bone structure of sepia (after Schmidt);
(c) billbergia leaf (Bromeliaceae), (after Kuester);
(d) sodium phosphate gelatine with calcium chloride (after Liesegang).

Figure 9—Natural and artificial structures
(e) Scales or Orbitolites (Forminifera), (after Rhumbler);
(f) calcium nitrate solution-drop, colored with India ink, placed on mixture of sodium nitrate, with traces of sodium carbonate (after Leduc);
(g, h) difflugia, protozoa with and without hardened shell (after Verworn);
(i) membrane of oil drop, formed with quartz grains;
(j) membrane of chloroform drop, formed with glass splinters;
(k) membrane of drop of mixture: chloroform, olive oil, alcoholic, shellac solution containing cinnabar and glass splinters (after Rhumbler);
(l) epithelial cells of frog;
(m) segmentation in an artificial cell (after Leduc).

vacuoles in the oily matrix (ground mass). If some bubbles burst on one side of such foam drops, the oil is not covered on that spot with a

soap layer, and thus the same conditions are obtained as if one would add to a homogeneous oil drop lying in water, soap solution from one side. Under these circumstances, the drop shows a progressive motion in the whole and currents in the interior reminding one of that in amœba. One explanation is that through lowering of the surface tension a disturbance is caused in the previous equilibrium of the surface tension. The strongest current is directly at the surface of the oil drop, causing the surrounding water to assume motion in the same direction.

2. *Absorption:*

The absorption of substances and their expulsion quite like the action of amœba forms may be demonstrated in the following experiments: A shellac filament is brought in contact with chloroform drops, or a shellacked glass filament is taken up in a chloroform drop, freed of the shellac and released again. (See Figure 7.c x d.)

3. *Excretion:*

Rhythmic precipitation of substances, found in pearls, shells, feathers and certain pigmented leaves may be imitated by the penetration of calcium chloride into gelatin containing sodium phosphate (see Figure 8.a — d)—or of silver nitrate diffusing into gelatine containing potassium chromate. Tissue-like structures may also be obtained by various methods (see Figure l — m).

4. *Division and multiplication:*

Dividing and radiating figures observed in cell reproduction may be imitated by using certain oils (see Figure 10), and mixing India ink in salt solution (see Figure 11); copulation may be imitated by the placing of chloroform on carbolic acid.

5. *Growth:*

Growth through accumulation of food substances may be imitated by chemical growth, the formation of artificially prepared films, and plant-like structures called mineral flower gardens and silica trees in the following manner, according to Talbot and Blanchard:

Small lumps or crystals of certain very soluble salts, *e. g.,* ferric chloride, copper chloride, nickel nitrate, cobalt chloride or manganese sulphate, are dropped into a solution of sodium silicate (water glass, sp. gr. 1.1). Their behavior resembles that of growing seeds, as they appear to immediately sprout and send up shoots toward the surface of the liquid, which grow with a visible rapidity. In fact, the salts

have at once commenced to dissolve, forming thin layers of very concentrated solution about each lump. At the surface, separating each

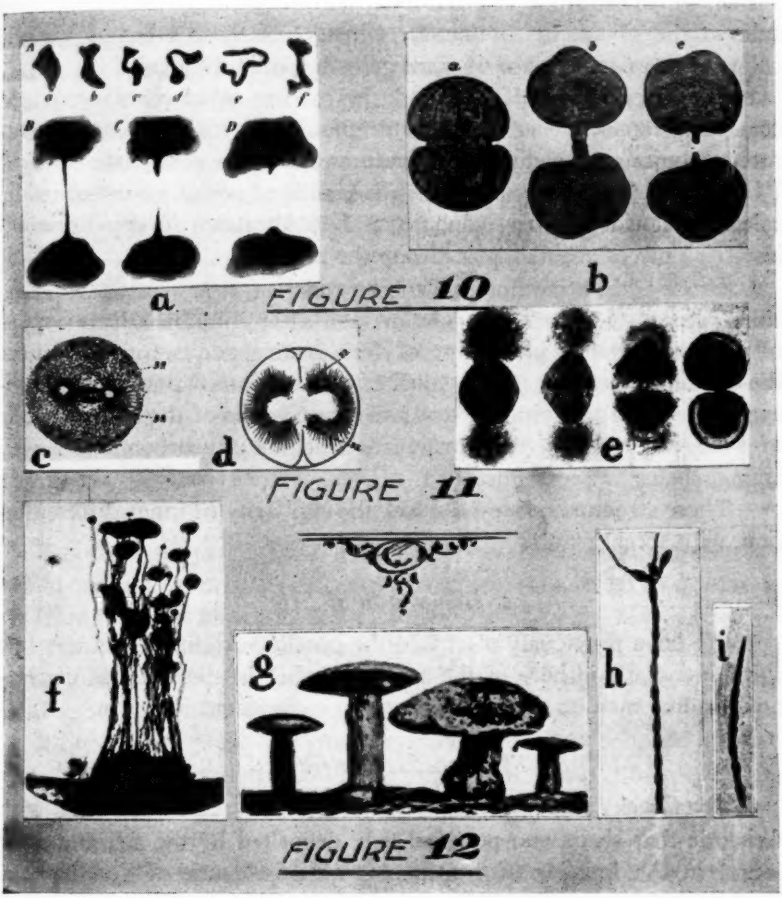


Figure 10—(a) Larva of meduca Eleutheria in progressive division (after Schulze); (b) night lamp—olive oil drop with two distribution centers (after Spek).
Figure 11—(c) Artificial spindle produce between two airbubbles in aqueous gelatine solution upon cooking, fixing and staining (after Rhumbler); (d) natural spindle of Echinusegg (after Fischel); (e) successive stages of artificial reproduction produced by placing India ink colored drops in salt solution of different molecular concentration and osmotic pressure (after Leduc).
Figure 12—(f, g, h) Artificial osmotic structures—"mental salt vegetation" (after Leduc); (i) sandy shelled Reophax nodulosa (after Brady).

of these layers of solution from the water glass, there forms a film of the insoluble silicate of the metal. This film is an osmotic membrane which allows water to pass either in or out, but the molecules of salt, not being able to pass through, exert against it their osmotic pressure,

and break it at its weakest part, which is always the top. This exposes a new surface of the salt solution to the sodium silicate, and a new film forms, which in turn is broken, thus permitting the growth of the little tube of the silicate of the metal. Clusters of these tubes of various colors give an appearance of plant growth within the liquid.

Silica trees may also be made by mixing equal parts (*e. g.*, 60 ccm.) sodium silicate solution (water glass) with each 60 ccm. of saturated solutions of sodium carbonate and sodium phosphate (Na_2H PO_4), with the double amount (360 ccm.) of water. Ferrichloride, calcium chloride, copper sulphate, and cobaltnitrate in dry (marble-like size) pieces are then placed into the mixture.

If one adds, according to Benecke and Jost, to a solution of potassium ferrocyanide and salt, gelatine, and after solution a little copper nitrate and sugar, a precipitate of ferrocyancopper is formed, where the solution of copper nitrate touches the solution of potassium ferrocyanide. This precipitate grows and reminds one of the entire outline of foliaged plants. Other structures resemble mushrooms and even animal shells. (See Figure 12 f — i.)

These structures, however, lack the similarity of inner differentiation, with actual plants.

5. Generation of Life

We have previously discussed the possible origin of life. A few words may be said here of the age-long belief in spontaneous generation, leading man on through the ages to experiment with life.

Spontaneous Generation

The Greeks and Romans, as ancient writers tell us, assumed with Aristotle that shells and petrified fish, deposited by the sea and later found in the interior of continents, were evidence of spontaneous hatching of organic creatures born in the mud without the aid of parents. The Middle Ages retained the ideas of Aristotle, and, with only a few exceptions, adopted the theories of the spontaneous generation of fossils or petrifications under varying formulæ, such as plastic force, petrifying force, action of the stars, freaks of nature, mineral concretions, carved stones, seminal vapors and many other analogous theories. In the seventeenth century, such beliefs founded on the faulty observations were still widely held. Shortly afterward, little by little, the theories were overthrown, and it was found that insects, amphibians and fishes are developed from eggs, and not through spontaneous generation.

With the discovery and use of the microscope, small organisms, infusoria were found to develop in extracts of dead substances, and henceforth the spontaneous generation at least of the lowest and simplest organisms was claimed. This belief was upheld until again it could be shown that these organisms developed from germs present in those substances or in the air to which the containers had been exposed. The splendid work of Pasteur and Robert Koch in modern bacteriology have also shown that even the most favorable culture media remain free from bacteria, provided they are made germ-free and are protected from the germs of the air, soil or water.

Modern conceptions of spontaneous generation venture in part the possibility of creating organisms other than we now know. Haeckel, for instance, assumed the initial generation not of celled organisms—but of homogenous, structureless, protein masses "Moneren" formed possibly through counteraction of substances dissolved in primordial seas. From these, through evolution, the cells and all forms living today are formed.

Artificial Generation

The attempts to generate living microbes from dead substances resemble experiments of Faust's pupil Wagner—who tried to compose man from chemical mixtures in his retorts.

Many have been the workers who have tried and tried again. Bastian quite recently proclaimed the solution of the riddle of life, but, alas, his laboratory experiments were not verified.

Burke claimed to have produced artificial life in test tubes by means of radium and sterilized bouillon, "Radiobes"—not multiplying—only lifelike in some respects—showing a few outward manifestations of life.

Mazur, bacteriologist of Lorrain, Ohio, now claims to have developed, with the aid of chemistry, sixteen varieties of cells (animals and plants). In support of his claim, reported by the Philadelphia *Public Ledger,* March 12, 1926, the scientist said he "has been able to create 5000 snails by the judicious use of sunlight playing upon a boiled mixture of chemicals and glue." Furthermore, he contends these have reproduced like normal snails.

His experiments with plant life, he admits, have not been entirely satisfactory. He has, he avers, been able to create an unidentified weed that perished after reaching a height of several inches. Greater success attended his efforts to create the lower forms of cell life such

as bacteria, he said, and refers to his success in making the penicillium cells, the tiny organisms found in damp cellars.

Depending upon what form of cell life he desires to make, Mr. Mazur boils together a certain chemical mixture, and after a period of subjection to sunlight, and in some cases to incubation, they evolve.

He anticipates the objections to be raised by scientists that the life which he asserts to have created was already present in the ingredients used.

"Scientists might justly ridicule my statements," he said, "if I had only created one or two varieties of cells or was unable to state in advance just what the result of each experiment would be. They might, in such a case, declare my results due to dirty apparatus or natural phenomena. But I am ready to submit a list of the sixteen cells I have made to a board of biologists and in their presence make any or all of them in the order they name."

He said that his findings broke down the basic principles of evolution—that life can come only from life. But, he said, they tend to support that portion of the theory of evolution which holds that in the beginning the first living cell rose spontaneously out of the earth when the cooling globe had reached a temperature, at which chemical and physical conditions combined to form the bits of life in the waters.

He believes that in time it would be possible to reproduce the animal and plant life of a million years ago and that even some unknown forms of life might be evolved from the scientists' laboratories.

He is now preparing to submit his experiments to a board of bacteriologists. If accepted by the scientific world, he says his findings will revolutionize biology and upset doctrines of both fundamentalism and evolution.

"Boiling," says Mazur, "will kill the vital speck, which I get from the air"; whether or not his findings are due to contamination—must be awaited by further reports, demonstrations and verification.

Other workers, *e. g.*, Dr. Bailey, of Liverpool, members of the Rockefeller Institute in New York and Federal Government laboratories have tried to generate life and failed. The ingenious Indian physiologist Bose has spent a lifetime working on the subject without the hoped for results. He concludes, however, "all substances manifest at least some of the phenomena of life, even metals are subject to fatigue, and need rest."

Searching for minute ultramicroscopic unfilterable signs of life have revealed the presence of the "bacteriophage" now under close investigation.

E. E. Free, writing in the *Forum* about the generation of life, states:

"We can now calculate what was the composition of the air and of the ocean when in the course of time the earth became cool enough to hold a watery ocean at all. The air contained no gaseous oxygen as it does now. All the oxygen had gone into chemical combinations. Whether the air contained any gaseous nitrogen is uncertain. What it unquestionably did contain was carbon monoxide, the deadly gas,—existing in the exhaust of automobile engines—and prussic or hydrocyanic acid. In the primitive ocean, having absorbed gases, and therefore full of deadly prussic acid and overlaid by an atmosphere containing large amounts of a poisonous gas no less deadly, the first life arose.

"It is reasonable to assume that there occurred some natural chemical synthesis of glycocoll or of a similar material. Glycocoll is the simplest amino acid, composed of four elements, oxygen, hydrogen, carbon and nitrogen obtained either by destructive treatment of protoplasm with caustic chemicals, or by a succession of chemical reactions between the three substances of the primeval ocean mentioned: prussic acid, carbon monoxide and water. During the three or five billion years which were to elapse before the period when we find actual traces of life in the rocks, there was ample time for such simple substances, as glycocoll, to undergo additional chemical changes and combinations and to be built up into more complicated forms perhaps at last into substances equivalent to our modern protoplasm."

We must work, therefore, he concludes, with solutions of carbon monoxide and of prussic acid in water, exposing them to conditions as similar as possible to those of the primeval ocean.

III. Conclusions

Recent advances in knowledge of life have demonstrated that the boundary line between animate and inanimate matter is less distinct than it ever was in the conception of man. The biologist with his fingers on the keys of life is gaining a continuously increasing mastery as a virtuose—and who knows, may ulimately succeed as a composer. The vista, alone, which man has opened by his discoveries of the radioactive properties of certain elements, is without parallel in the whole history of science.

Man has learned to grow and perpetuate plant and animal tissue, such as frog embryo, chicken heart, human connective tissue, has regenerated organs and rejuvenated organisms, has disintegrated the molecules and penetrated with Roentgen rays and other physical and chemical means the very organization of the living cell. Yes, man has even been able to initiate cell division, a most wonderful life process, through ordinary physical and chemical methods.

He dares, as McDonald does, to define Life as the relation of the force energy to the apparatus protoplasm, and protoplasm as an apparatus for transforming energy; to consider as the basis of life the organic colloid cell surrounded by a semi-permeable membrane existing in an aqueous continuous phase.

He even ventures the attack on the problem of artificial life. He simulates life structures, compounds life substances, and undauntedly tries experiments to create life itself. Not having succeeded in air, containing oxygen, he attempts now, as Free suggests, to arrange the setting of conditions likely existing when the first life was being formed in the ancient ocean.

Comparing life with fire, Lotka concludes that in nature, undisturbed by man, the starting of a fire is a rare event; and that after all is the most that we can say positively regarding the origination of life from the non-living; it is either so rare or so unobtrusive an event as to have escaped our observation. No doubt it took man many thousands of years to acquire the art of lighting a fire; may not, in the lapse of time, a second Promethus arise to teach us also how to kindle the torch of life?

Many a biological explorer will try to create life, that is, to find exactly the right combination of chemicals and circumstances to make creation a possibility. Will anyone succeed? Perhaps. Let us not close our minds to the possibility or bar his way. Let us rather enhearten the grasping, intrepid adventurer—the aspiring engineer of life.

The Godly Task

Skeletons scattered 'neath scum and crust
  Tell us their time-worn tale:
Myriads moulded of mud and dust
  Live but to fade and fail.

This dying life, mysterious sign,
  Scarce yielding to searching probe,
Pulsates for æons in sun-glow's shine—
  The riddle, still, of the globe.

Who dares to gain or imitate
  God's mastery and skill:
Control of life, force to create?—
  Man has unconquered will!

—*Arno Viehoever.*

PHOTOGRAPHING POLLEN

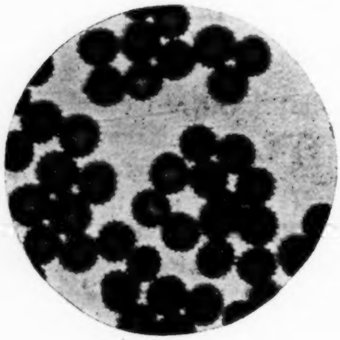
Henry Leffmann and Max Trumper

POLLEN has been extensively studied, both for merely morphologic data and of late years on account of its relation to the condition commonly known as hay-fever. Some of the recent data were summarized in an editorial in the August (1926) issue of this JOURNAL, referring especially to the extensive work carried out by experts in Colorado and also the important observation of Professor Potts of Bloemfontein, South Africa, that the pollen of the so-called pepper tree (*Schinus molle* L) caused hay-fever, the dryness and windiness of the climate, causing it to be blown about, although naturally sticky and insect-borne.

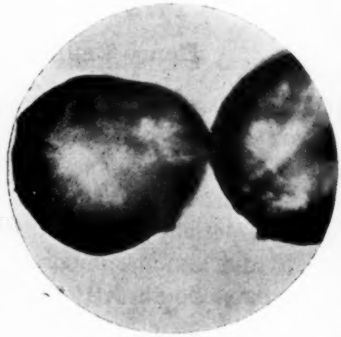
Pollen presents considerable variety, but mostly of few distinct types. Most plants produce rounded grains, spheres or prolate and less commonly, oblate spheroids. Angular forms are, however, not rare. Very complex forms are sometimes observed. In the eastern United States one of the most pecular is that of the evening primrose, (*Oenothera biennis* L), very large, triangular with rounded corners, and connected by glutinous threads, which entangle insects. Representations of pollen grains were, of course, originally made by direct drawing from the field of the microscope, but now-a-days photography affords a very rapid and satisfactory method. Pollen from a given species are fairly uniform in size and shape, though, as always happens with living organisms, monstrosities occur. When the grains of different species are compared much difference is noted. Some plants produce very small grains, others very large. The mallows (*Malvaceae*) produce as a rule very large grains; those of the *Compositae* are small. Both are heavily spiculated. The pollen of Indian corn is very large, but free from spiculations. The difference is important, for it shows that the spiculations have nothing to do with the causation of hay-fever, since the pollen of Indian corn and ragweed (the latter belonging to the *Compositae* and strongly spiculated) cause the disease, while the grains of the common ox-eye daisy and the shrubby Althea (the former quite small, the latter very large), both strongly spiculated, are not suspected of doing harm.

There is considerable difference in the amount of pollen produced by different species. It would be naturally supposed that those plants which depend entirely on wind distribution would produce most

POLLENS. HIGHLY MAGNIFIED

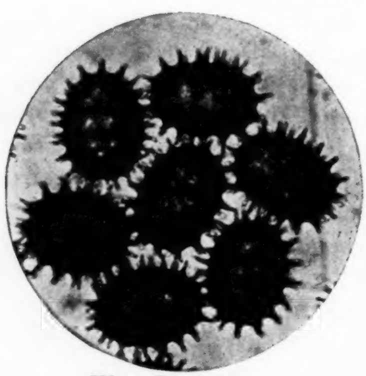


RAGWEED
Ambrosia trifida L.

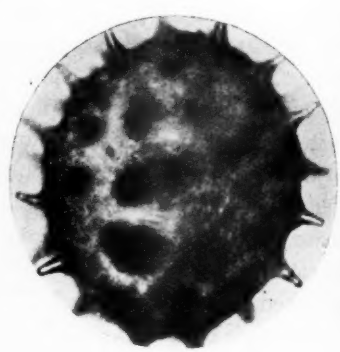


INDIAN CORN
Zea mays L.

EVENING PRIMROSE
Oenothera biennis L.



WILD SUNFLOWER
Helianthus sp.



SHRUBBY ALTHEA
Hibiscus syriacus L.

Courtesy of the Wagner Free Institute of Science, Philadelphia

abundantly, and this is found to be frequently the case. Darwin, in "Origin of Species," called attention to the contrast in this respect between the minute amounts of pollen and the complicated methods of fertilization in orchids and the excessive quantities in the pines with haphazard, wasteful methods of wind distribution. He used the facts as illustrations of irregular teleology in nature. In the Colorado survey under the auspices of Dr. Waring and Miss Pope, many data were collected concerning the abundance of pollen produced by the species of that district. Dusty pollens are generally easily gathered, but in many species, especially grasses, satisfactory collection can only be made early in the day. Close study of flowers shows a great deal of association with minute insects entirely different from the nectar-seeking species that are now universally credited with a necessary relation to fertilization. In many cases, probably, the small insects are merely predatory, feeding on the pollen as a source of protein. It seems that this peculiar "insect-flower symbiosis," as it may be termed, needs extensive investigation. Flowers of the *Compositae,* such as common asters, goldenrods, sunflowers, are apparently largely cross-fertilized by minute insects quite different in structure and systematic relationships from bees, wasps and similar social groups. The difference in the abundance of pollen and the fact that many forms are quite sticky, makes collections of specimens sometimes difficult. For direct examination under moderate power, this can be overcome easily, but in photography it is necessary to have the grains in one layer and well separated. In many cases very satisfactory results can be obtained by the use of pure benzene (C_6H_6). The pollen-bearing portions of the flower are placed in small test tube (about 7 cm. x 1 cm.) and a small amount of benzene poured on. The sticky material on the grains is mostly dissolved and the pollen falls soon to the bottom of the tube. A small amount of this can be taken up by means of a narrow tube and dropped on the center of the slide. The liquid quickly evaporates and the pollen is left as deposit which adheres to the glass sufficiently to allow the slide to be placed in a horizontal photographing apparatus. If the amount of the pollen is large it will be best to spread it over a larger area on the slide. The degree of magnification must, of course, be dependent on circumstances and upon the size of the grains. Ragweed pollen requires rather high powers to bring out its characteristics, but as noted above, pollens of the mallow family can be obtained in very satisfactory forms by low powers.

Probably the best way in which to preserve data concerning size and form is by careful photography, but it is often desirable to mount specimens for further examination. They are best mounted dry. Grains obtained by the benzene method above described are usually satisfactory without further treatment. A convenient method is to wipe off all but an area about an eighth of an inch in diameter, place on the slide a small square of this paper (onion-skin) through which a perforation has been made by an eyelet punch, lay on this a clean glass cover and then fasten a strip of dark passe-partout paper, which has been perforated with a somewhat larger opening than the eyelet hole. Slides prepared in this manner are very convenient for examination under high powers as the small area offered renders searching unnecessary. Experiments are now being made to determine whether celluloid can be used both for the slide and cover, which, if successful, will render the preparations non-fragile. Some illustrations are appended of pollens photographed by apparatus in the research laboratory of the Wagner Free Institute of Science in Philadelphia.

UNITING THE FORCES OF PHARMACY*

Sir William S. Glyn-Jones

I VALUE the honor of being asked to take part in the Annual Meeting of the American Pharmaceutical Association. For a long time I have been an interested reader of the Journal and particularly of the proceedings of your annual meeting.

I know a great deal about the conditions affecting the practice of pharmacy in Great Britain and something about the way it is conducted in the principal European countries.

I have recently had opportunities of learning something about the condition affecting the calling in Canada, but regret that up to the present I have acquired little personal knowledge of the conditions pertaining in the United States.

From what I have seen on this side of the Atlantic, I am more than ever convinced that the problems confronting those concerned about the betterment of pharmacy are much the same the world over.

*An address delivered by Sir William S. Glyn-Jones before the General Sessions of the Convention of the American Pharmaceutical Association, Philadelphia, Pa., September 16, 1926.

These difficulties differ not so much in kind as in degree. They are probably due, in the first place, to the difficulty of defining the exact work which it is the particular function of the pharmacist to perform.

Pharmacists themselves are not always in agreement as to this, and where they are it is not so easy to educate the public to acceptance of the pharmacist's estimate of his proper functions.

The description of pharmacy as being the handmaid of medicine is a very old one, but it does not help very much, for as there are mistresses and mistresses, so there are handmaidens and handmaidens.

In Great Britain the medical and pharmaceutical professions are far from agreed as to where the work of one begins and the other ends.

If I were asked for a short description of the true function of the pharmacist I should say it was that of preparing and supplying materia medica, using materia medica in the widest possible sense to include all the material the medical man uses, both for diagnosis and treatment.

In some of the countries on the Continent of Europe the medical profession, as a whole, has gone further towards the acceptance of the position that it is the duty of the medical man to diagnose and prescribe and that of the pharmacist to dispense and supply the material prescribed than is the case in Great Britain, or as far as I can judge on this side of the Atlantic. Most of our difficulties I attribute to medical men and pharmacists, unlike the cobblers, are refusing to stick to their lasts, and in this respect, both are to blame.

In Great Britain there are signs that the leaders of both professions recognize that pharmacy is, after all, a branch of the Science and Art of Medicine.

It is significant that last year the University of London in the Faculty of Medicine established a Degree in Pharmacy.

Medical science, during the last half century, has developed so rapidly that it is impossible for a general practitioner to be proficient in all its branches.

Those who are best qualified to be proficient in all its branches assure me that the curriculum of the medical student today is greatly overloaded, and that it is impossible for any one person to acquire adequate knowledge to enable him efficiently to practice the art in all its varied branches.

Even if one could, in his student days, acquire the knowledge, it

would be impossible to retain it and keep it up to date—hence the necessity for specialization.

The amount of training which the average medical man, at any time, has received in the art of pharmacy is very small, and it is only natural that the subject has been almost crowded out of the medical student's curriculum by the more important branches of Medical Science and Art; pharmacy is a branch which is becoming more intricate and extended.

Vaccines and sera are as truly materia medica as are the old blue pill and black draught. Substances of animal origin and others requiring for their standardization, tests other than those provided by chemical analysis are on the increase.

The scientific training required to fit for his work the person who is to supply and test them is in advance of that necessary for the preparation and supplying of the old forms of galenicals.

It is in the interest of both the medical and pharmaceutical professions, and indeed of the public at large, that the leaders of both professions should, as far as possible, agree upon the line of demarcation between their respective functions.

Most of what on the part of the pharmacist is complained of by the medical profession, is due to the fact that the body of men have been trained for work for which they have received the hallmark of competence, which state recognition denotes, and then they find that such work is not left for them to do.

They turn their knowledge of materia medica to uses which, if there was a proper understanding between the professions, they would find unnecessary.

The great majority of druggists in Great Britain would be unable to live if they were dependent solely upon the income they derive from pure pharmacy, taking my definition of that term.

Many of them derive the greater part of their income from the profit they make in retailing wares which, by no stretch of the imagination, can be described as materia medica and, as far as I have yet seen, this seems to be even more true in Canada and United States.

The British National scheme of Health Insurance has in recent years had a profound effect on British Pharmacy. About fifteen millions of the industrial population have medical treatment provided through the State scheme, and under that same scheme medical men are not allowed to dispense, except in areas where there are no druggists or in cases of emergency.

A description of this scheme would probably interest you but it would take too long.

In Great Britain we talk about the professional and commercial sides of pharmacy, here you use a term, the full significance of which I have not yet been able to grasp—you talk of the ethical pharmacist.

Why selling sponges or serving drinks at a soda fountain, giving good value for money, is not an ethical proceeding I fail to see.

The superior airs sometimes adopted by the so-called professional pharmacist, when talking about his brother pharmacist who has less pharmacy to do and whose work is more that of a retail tradesman are seldom justified and don't help matters.

Owing to the conditions I have described, there has been in Great Britain, as well as on this continent, one perpetual struggle between those who desire to lift the work of the pharmacist to a level of higher skilled profession and those who care nothing for these things, being only concerned with what they call the commercial interests of the trade.

On the one hand you have those who sought to increase the scope of the training, the stringency of the qualifying examinations, the length of the college courses, the establishment of University degrees in Pharmacy, and in these directions would go further than immediate conditions justify.

At the other extreme are those whose one desire seems to be to turn out an adequate supply of efficient and cheap, as we call them, assistants, or as you call them, clerks. In between these extremes there has been the majority who have favored a middle course.

The Pharmaceutical Society of Great Britain is a body trusted with the examination and registration of pharmacists, the enforcement of the various pharmaceutical laws, and the making of statutory regulations governing the conduct of the pharmacist. Membership is a voluntary matter.

It is illegal to those not registered as pharmacists to describe themselves as chemists, druggists or pharmacists, or to sell any one of the substances scheduled as poisons under the Pharmacy Act.

The schedule is fairly extensive and as any article proprietary or otherwise, containing a schedule poison is brought within the schedule, the effect is to make it difficult for anyone to conduct the drug business who is not registered, although there are quite a large number of such businesses.

There was a growing opinion that such a body could not do its statutory work, and at the same time function as a kind of trade union, protecting the interests, commercially and otherwise, of its members, and the Law Courts quite recently decided that there were certain functions of that character which it would be *ultra vires* the society's charter for it to undertake.

This led to the shedding of some of its functions by the Society. There was in existence a Society known as the Chemists' Defense Association, which, amongst other things, provided legal assistance for its members when charged under one or other of the many Acts of Parliament and regulations especially affecting the pharmacist, and insured its members against damage to mistakes or alleged mistakes in dispensing or supplying medicaments.

This Association added to its functions those of a trade union, and under the titles of Chemists' Defense Association and Retail Pharmacists' Union it now takes care of vital matters coming more within the commercial than the professional side of pharmacy.

Between the Pharmaceutical Society, this other body, and a third organization, the P. A. T. A., of Great Britain, which I am now coming to, there can be little doubt that pharmacy, in the matter of organization, is one of the best served of any profession or trade in Great Britain.

The Government has appointed a Department Committee, which commences work next month, to consider what modifications, if any, are necessary or desirable in the Poison and Pharmacy Laws, and it is possible that the whole position of British Pharmacy and the conditions under which it is carried on may be in the melting pot.

Thirty years ago the exploitation of proprietary articles, medicinal and toilet was so rampant that it endangered the very existence of the druggists carrying on an individual business.

You know all about the evils and I should be wasting my time in enlarging on them. Serious as was the loss of profit, the danger to the morale of the pharmacist was perhaps even more serious.

Then the Proprietary Articles Trade Association was brought into existence and gradually received the support of all classes of pharmacists, including those who had a high class dispensing business and sold few proprietary medicines.

Many who thought it degrading to sell the articles at all realized that, if they had to be sold, they might just as well be handled at a profit as not.

The history of the early days of that Association was one of great struggles. In its early stages it received the support of about twelve proprietary manufacturers, not half of the wholesalers, and barely 25 per cent. of the retailers.

That Association was organized on sound lines, seeing that it embraced, in one organization, the three sections of the trade, and that the manufacturers stood together in withholding and requiring the wholesalers not to supply any article on the list to anyone that sold even one article below the minimum price.

In Great Britain there are on the list some thousands of articles owned by about 500 manufacturers, members of the P. A. T. A., and sold by anywhere between sixty and eighty thousand traders.

If it were part of the Law of England that no article should be below the minimum price, there would not be fewer cases of cutting prices than there are amongst those eighty thousand traders today.

Wholesalers of all types, departmental stores, chain stores and individual druggists all alike now accept the price maintenance policy as the normal condition of things.

Last year the Canadian drug trade invited me to tell them of our work in Great Britain and I went through the Dominion from coast to coast.

It was decided to form an organization on similar lines to that which was working in Great Britain.

In less than two years over 90 per cent. of the retail druggists of Canada have joined the Association and paid up their dues, and quite 80 per cent. of the wholesalers, including both the service and co-operative houses.

The Association was finally formed and the Council elected in March of this year and the Association started to function on August 28th, when its first list was published.

The list contains 600 articles, owned by 157 separate manufacturing firms. Most of the articles on the list are leading sellers in Canada and many of them articles of largest sale in the United States.

On Friday, the 27th of August, the conditions as regards these articles in Canada were similar to those in the United States.

The great majority were being cut and sold to the public at prices, in many cases, less than the retailer could buy from the wholesaler.

Minimum prices were fixed and in one night a complete change was brought about throughout the whole Dominion. Next morning,

with the exception of Toronto and Hamilton, our prices were in force and these two cities fell in line in less than a week.

At the present moment, with the exception of two firms in Vancouver, these articles are being sold throughout the whole Dominion of Canada at not less than the minimum prices. So in one night the whole aspect of the drug trade in Canada changed.

The secret of the success in Canada is the same as that which enables the plan to work in Great Britain—it is that, instead of manufacturers, wholesalers and retailers working in separate organizations in the furtherance of their own sectional interests, they have realized that the manufacturing and distributing of these proprietary articles involves a partnership. The Association, as members of one firm, are working a plan whereby by exercising the power to withhold supplies of all, if one is cut, the trade are all on the level with a profit, instead of being on the level without a profit.

As I understand, you have certain enactments in the United States which make such a plan here illegal. I should be foolish and discourteous if, as a stranger, I discussed this aspect of the question.

It looks as if any combination to maintain prices in the United States is prohibited by law. In Great Britain there is no such law, provided it can be shown that those in the combination are actuated by the motive of preserving and enhancing their own interests and not with the object of injuring others.

In English Law there is no other restriction. In Canada they have a certain middle position; there you can have combination to maintain prices but the result must not be to enhance prices unreasonably or unduly, or to unreasonably limit competition.

Already an action has been taken against the Canadian Association, the result of which we do not fear. We are satisfied that what is morally right in Great Britain cannot be immoral in Canada and we have no fear of litigation or legislation.

The method of charging certain people reduced trade prices is only a convenient way of paying the distributor for his services and there is no law, and cannot be any law, which will prevent manufacturers, in one way or another, paying those who stock and distribute their articles for the services they render.

So far as I have been able to follow the position in the United States, whilst the convenient system of providing the remuneration, the wages of the distributor, by making a difference between the price of purchasing and the price of selling, is being rendered in-

operative, it would be possible for an organization comprising the three sections—manufacturer, wholesaler and retailer—abandoning altogether what I admit to be a convenient system of charging reduced trade prices, to provide remuneration to the distributor by devising through that organization a system of payment for services rendered which would not involve any price fixing whatever.

In any case I venture to suggest, in the light of our experience in Great Britain and Canada, that the first essential to success is the establishment of an organization in the United States comprising the three sections of the trade to work out plans either for securing an alteration of your law or with the laws unchanged for enabling wholesalers and retailers to receive for their services such a recompense as will secure their cooperation with the manufacturers in providing free channels for distribution to the consumer of proprietary articles.

If you agree with me that as druggists our problems, professional, educational and commercial are really world wide, you will share my desire for a much closer connection between the various pharmaceutical organizations in Europe and on this side of the Atlantic.

Take the question of narcotics, or, as we call them in Great Britain, "dangerous drugs." In all the countries legislation and regulation are forthcoming with disquieting frequency.

Some of us are beginning to feel that there should be some limit to the inconvenience, annoyance and sometimes hardship caused to the 98 per cent. normal, healthy, law abiding citizens in the interest or the alleged interest of the 2 per cent. immoral and physical degenerates.

For the solution of these difficulties we need to pool the combined wisdom and experience of the best pharmacists the world over.

In my opinion it is not enough that we should send as messengers to convey friendly greetings to annual conventions, someone or other who happens to be visiting the country and who are not always qualified to serve as efficient ambassadors.

These National organizations should, I think, exchange as visitors to each other's conventions pharmacists specially selected for the purpose.

If I may say so, the Canadian Pharmaceutical Association has followed an excellent example by sending to this meeting Dean Burbrige and Dr. Stanbury.

I hope to see the day when the International Pharmaceutical Federation, the United States organizations, the Canadian Pharma-

ceutical Association, the British and Irish Societies will always have at their annual conventions men of the type Canada has sent here today, from all those respective organizations. It would cost money which would be well spent.

Next week I am returning to England for a few weeks and I would be delighted to carry to the National pharmaceutical organizations there any message which your Association entrusts to me.

I will esteem in both a privilege and an honor to be allowed to play a part, however small, in bringing about closer international co-operation amongst the pharmacists of the world so that the world over the pharmacist may be the better placed for serving the public and for the exercise of a calling under conditions which enable him to retain his own self-respect, the confidence of the medical profession and the esteem of the general public.

ABSTRACTS OF PAPERS READ AT THE SESSIONS OF THE SCIENTIFIC SECTION OF THE AMERICAN PHARMACEUTICAL ASSOCIATION*†

The Colorimetric Assay of Digitalis. L. W. Rowe.

The Knudson and Dresbach picric acid colorimetric method was used on fully one hundred preparations of digitalis and results were compared with those obtained by the M. L. D. frog method. Various standards including the artificial potassium dichromate standard were tried. The accuracy of the two methods was also checked by the assay of dilutions that were unknown to the person making the tests. Possible causes for the inconsistency between the two methods are discussed.

The Colorimetric Assay of Strophanthus. L. W. Rowe.

About fifty assays of strophanthus preparations were made by the colorimetric method and compared with those by the M. L. D. frog method. Several unknowns were tested and results were very similar to those with the M. L. D. method. Reasons for consistency between the physiological and colorimetric results are discussed.

The Possible Influence of Ether Anæsthesia on the Accuracy of the Cat Method of Digitalis Assay. H. B. Haag.

*Philadelphia, week of September 13.

†The papers will be printed in full in *The Journal of the American Pharmaceutical Association.*

It has been shown that digitalis lowers the resistance of an animal to poisoning by alcohol; this has raised the question as to the influence that ether anæsthesia may exert on the accuracy of the cat method for the assay of digitalis. To determine this, assays of tincture of digitalis have been carried out on decebrated cats.

An Assay Method for Digitalis Based on the Relationship Between the Lethal Dose of the Drug and the Weight of the Heart. W. R. Bond.

The result of several series of assays of digitalis by the Hatcher-Brodie cat method apparently shows less variation when the minimum lethal dose is calculated on the basis of heart weight, than when calculated with reference to the total body weight.

Additional Studies on Mire. Thomas S. Githens.

Mire has been shown to be Brunfelsia Hydrangæformis or a closely related species. Chemically and pharmacodynamically it resembles Manaca, which is the root of Brunfelsia Hopeana.

The Influence of Digitalis on the Resistance of Guinea Pigs to Poisoning by Diphtheria Toxin. Charles C. Haskell.

McCulloch first called attention to the fact that the cardiac changes observed clinically in diphtheria resemble those seen in poisoning by digitalis; from this observation, he concluded that digitalis is contraindicated in diphtheria. Since the appearance of McCulloch's paper, other authors have stated that the drug is contraindicated in a number of acute infections.

The fact that digitalis in overdose produces certain changes in the heart which resemble those produced by bacterial toxins does not, it seems, render it necessary that moderate doses of digitalis will lower the resistance of animals or human beings to these bacterial toxins. To determine this, it would suffice to ascertain whether digitalis either hastened death after a lethal dose of some bacterial toxin, where recovery would occur unless the digitalis was used.

In the present experiments, diphtheria toxin has been selected for the sake of convenience. It has been found that doses of the tincture of digitalis as large as 80 per cent. of the average M. L. D. apparently do not hasten the death of guinea-pigs that receive, coincidentally, a dose of diphtheria toxin which is fatal in from five to ten days.

The Earthworm Method for Testing Santonin and Related Anthelmintics. Albert Schneider.

The method is a modification of the Trendelenburg method in which segments of worms are exposed to varying strength solutions of the lactonic anthelmintics and noting the degree of the spasmodic conrac-

tion produced within a specified period of time. The rating of the anthelmintics is based on the spasm-producing properties of the drug, and not upon its toxic action. The spasm-eliciting action of the lactonic anthelmintics is reversible. The test is simple and since earthworms are abundant everywhere, the method should find favor in pharmacologic laboratories.

Dermographia alba and Dermographia rubra as Indicators of Adrenal Imbalance. Albert Schneider.

Dermographia alba indicates adrenal hypo-function, whereas dermographia rubra indicates adrenal hyperfunction. Somewhat over 60 per cent. of a group of ninety-three students showed endocrinal imbalance according to the two tests mentioned and including the Goetsch test for thyroid hyperactivity. The tests are simple and well-defined and should prove of great value to the physician in clinical diagnosis.

Pulse Rate Reduction as a Measure of Digitalis Action and to Dosage. Albert Schneider.

Ninety-three students with pulse rates ranging from sixty to eighty per minute, were each given 0.1 cc. per kilo of body weight (weight of clothing deducted) of the freshly prepared infusion of digitalis, and the changes in pulse rate noted. Two group tests were made. In the first the digitalis was given *without* calcium lactate, and in the second series of tests made two weeks later, the digitalis infusion was combined *with* three grains of calcium lactate. The results of the tests showed that the average per cent. reduction in pulse rate after giving digitalis of U. S. P. strength, in the dosage indicated, was ten, and that calcium lactate increases and stabilizes the digitalis action. Two or three per cent. of the students showed no change in pulse rate, and in some the results were inconclusive. The indications are that the physician can use the pulse rate reduction following the administration of digitalis as a guide to therapeutic action and also to dosage, and the suggestion is offered that a 10 per cent. reduction in rate within one hour of time represents approximately the full therapeutic action of the drug.

Respiration Tests as a Substitute for the Usual Basal Rate Determinations. Albert Schneider.

The breath-holding power or capacity, in seconds, with lungs deflated, under basal rate conditions, yields results which harmonize closely with the results obtained by means of the metabolors. Tests made by 115 students taking the laboratory course in pharmacology, showed that the time in seconds is in proportion to age, to sex, and to body surface area, and that it is a measure of the volume of the reserve tissue oxygen and of the rate of reserve tissue oxygen consumption. The time in seconds ranges

from fifteen to thirty for normal persons in the age range from twenty to sixty years (males). Tentative averages or norms for age, sex and body surface area are given and the factors which influence the time in seconds are listed. The tests were made in association with the usual tests for vital capacity and breath-holding power with lungs fully expanded, and it is suggested that these simple respiratory tests may be used in place of the time-consuming and expensive metabolic determinations.

Permanganate Solution as a Cure for Impetigo. Edward H. Carus.

The eruptive eczema known as impetigo is not easily cured. It is found that a strong solution of potassium permanganate applied after the breaking open of the white eruptions that have come to a head is a rapid cure for this troublesome skin disease. It is recommended that physicians and pharmacists make further study as to the possibilities of using permanganate for similar troubles. Permanganate is well known in the treatment of poison ivy.

The Glucosides of Caulophyllum Thalictroides. Edward D. Davy and H. P. Chu.

The work of isolating the active constituents from caulophyllum was started with the intention eventually to determine to which of these agents the physiological activity may be assigned. (1) The method of Power and Solway was followed, and yielded the alkaloid methylcytisine and a non-crystalline glucosidal material. They previously had reported *J. of Chem. Soc.*, 1913, two crystalline glucosides. (2) A modification of the method of Power and Solway likewise resulted in non-crystalline glucosidal material. (3) Moistening the drug to allow enzyme action, previous to extraction, resulted in the recovery of a crystalline glucoside and also some non-crystalline glucosidal material. (4) In the absence of enzyme action, only non-crystalline glucoside was obtained.

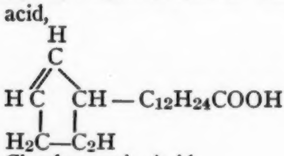
Enzyme action results in crystalline and non-crystalline glucosidal products, which differ also by their solubility in alcohol.

A Revision of the Pentanols. S. M. Gordon and Edward Kremers.

The identification of any one of the eight isomeric pentanols would seem a relatively simple matter. Yet anyone who attempts the task and looks up the literature on the subject will find that it is woefully deficient. To supply this deficiency so far as material was available became the task of this investigation resulting in the preparation of eleven hitherto unprepared derivatives of eight amyl alcohols, *viz.*, 3, 5—Dinitrobenzoates of 1. Pentanol—2; 2. Pentanol—3; 3. Methyl—3 butanol—1; 4. Methyl—2 butanol—1; 5. Tertiary amyl alcohol. a-Naphthyl urethanes of 1. normal amyl alcohol; 2. pentanol—2; 3. nitro phthalic acid esters of 1. Normal amyl alcohol 2. Pentanol—2; 3. Pentanol—3.

The Fatty Acids of Bixa orellana (Annatto). Lloyd Harris and Edward Kremers.

The close botanical relationship of this plant to the plants yielding chaulmoogric acid seemed to make it desirable to ascertain whether this new acid might be obtained from processed annatto seeds, now a waste product in the production of cheese and butter color. The preliminary investigation by Aiyar was repeated on a much larger scale but with equally negative results. Bixa seeds, however, contain the isomeric linolic acid,



Chaulmoogric Acid

$$CH_3(CH_2)_3CH{:}CH\ \ CH_2CH{:}CH\ (CH)_2CH_2COOH$$

Linolic Acid

also the more saturated stearic acid with 18 carbon atoms and the less saturated linolenic acid with the same number of carbon atoms.

The Glucosidal Pigment of Bixa orellana (Annatto). Lloyd Harris and Edward Kremers.

Bixin, the red pigment separated from the seed coating has thus far baffled the structural chemist. Another pigment isolated from the glucoside was first prepared by Aiyar (see *Journ. A. Ph. A.*). It has now been prepared on a larger scale and attempts have been made to ascertain its relationship to bixin, but no definite results have thus far been obtained any more than by numerous previous investigators in connection with bixin itself.

On the Biochemical Significance of the Occurrence of Vanillyl Alcohol in Ginger. P. Valenzuela and Edward Kremers.

Ginger is used largely because of its pungent principle or principles. Since the discovery of the constitution of zingerone the isolation of vanillyl alcohol in ginger acquires a significance that would not have been previously suspected.

On the Significance of Methyl-3 Butanol-1 in Peppermint. S. M. Gordon and Edward Kremers.

The occurrence of an amyl alcohol as well as of a valeric acid in peppermint has been accepted for some time. Interesting as was the establishment of both of these substances, the importance of their biochemical significance became apparent only then when they could be established as autoxidation and autoreduction products of methyl-3 butanol-1.

$$\begin{array}{l} CH_3CH\ CH\ CHO \\ \quad CH_3 \end{array} \ - \ \left\{ \begin{array}{l} CH_3CH\ CH\ CH_2OH \\ \quad\ CH_3 \\ CH_3CH\ CH\ COOH \\ \quad\ CH_3 \end{array} \right.$$

Research Laboratories for the A. Ph. A. Edward Swallow.

The A. Ph. A. proposes to have research laboratories of its own in the headquarters building, and the following suggestions are made: (1) The desirability of such research laboratories functioning for American Pharmacy in the same manner as the chemical laboratories do for the American Medical Association is pointed out. (2) The suggestion is also made that Industrial Fellowships on the same lines as those adopted by the Mellon Institute and Pittsburgh University, would both add to the usefulness of these laboratories and bring honor, dignity and more professional status to the pharmacist generally.

The Effect of Benzoic and Cinnamic Acids on the Rate of Development of Rancidity in Lard. William J. Husa and Lydia M. Husa.

A search of the literature has shown a lack of agreement as to which constituents of benzoin are effective in retarding the rancidity of lard. The retarding action has variously been ascribed to the benzoic acid, cinnamic acid, volatile oil, resin and odorous constituents.

Experiments have been carried out to determine the effect of benzoic acid, and cinnamic acid on the rate of development of rancidity in lard. The Kreis test was used for detecting rancidity, the odor of the test samples serving as a confirmatory test. The tests were carried out as follows: 5 cc. portions of lard, with and without added substances, were placed in stoppered test tubes of about 30 cc. capacity and exposed to the light. After suitable intervals the odor was noted and the entire sample then used in making the Kreis test.

0.1 per cent., 2 per cent. and 4 per cent. of benzoic acid proved ineffective in retarding the development of rancidity. 0.1 per cent and 4 per cent. of cinnamic acid likewise were not effective. Lard containing a mixture of benzoic and cinnamic acids, 1 per cent. of each acid being used, became rancid just as rapidly as the pure lard.

A New Type of Preparations of Vegetable Drugs. Thomas S. Githens.

The paper first points out that the pharmacopeal preparations of plant drugs are based on the conception that it is desirable to "extract the drugs as completely as possible," this complete extraction leading to the inclusion in the final product of a very large amount of undesirable, unnecessary and inert matter. There are no preparations between such galenicals and pure alkaloids, which do not have the exact form in which they are present in the drug.

Many vegetable drugs would be more useful if preparations containing the principles in unaltered form with a minimum of the other constituents, were available. The ideal should be to reduce the total solids per unit of activity, as much as possible.

Tentative processes are outlined for digitalis, squill and ergot.

Analysis of Camphorated Oil U. S. P. X. Charles F. Poe.

In comparing the method given for the determination of camphor in camphor liniment in the U. S. P. IX with the one given in the last Pharmacopœia, there has been found to be considerable difference. The evaporation method runs as much as one and one-half per cent. lower than the distillation method.

A number of determinations were made in porcelain dishes to find out the error of the method. Samples of liniments were made from various oils and camphors. Determinations were then made in aluminum and porcelain dishes. These determinations ran from 0.34 per cent. to 1.6 per cent. low.

Determinations were then made using various kinds of dishes such as platinum, alundum, lead, nickel, silver, quartz and glass. The samples of oil, without any camphor, were also heated in these dishes so as to determine the change in weight due to the oils alone.

Determinations were also made on the different samples of camphor liniment, and the oils from which these were made, using a vacuum oven.

Observations Upon the Quantitative Determination of the Anthraquinone Derivatives of Cathartic Drugs. George D. Beal and Muppana C. Tumminkatti.

An examination of the quantitative methods for the determination of the derivatives of anthraquinone which are present in cathartic drugs shows that they may be divided into three types. These are gravimetric precipitation methods, gravimetric extraction methods and colorimetric methods. The first depend upon the formation of metallic salts or condensation with such agents as diazonitranilin; the second upon the extraction of the anthraquinones in as pure a form as possible, which are then weighed; and the third upon the formation of a colored compound, the amount of which is determined by comparison of its depth of color with that produced by the constituents in the pure state undergoing the same reaction. All are based upon the assumption that the anthraquinone derivatives are the substances to which the valuable aperient properties of the drugs of this group are due.

The Need of Greater Activity in the Making of Analyses of Medicinal Preparations Found in the Open Market and of a Wider Publicity of the Analyses. F. J. Wulling.

Reference is made to the many annual reports of Dr. G. Bachman to the Minn. S. P. A., assisted by his classes in U. S. P. Testing and Assay, on the identity, purity, and strengths of U. S. P. and N. F. and other pharmaceutical, medicinal, and chemical preparations and salts.

The suggestion is made that all state associations and colleges of pharmacy do more work of this sort and that greater publicity should be given to these reports and to those from other sources, and that some of the information brought to light should interest the boards of pharmacy

who rightly are increasing their activities beyond just periodical examinations of candidates for licensure.

A too critical or meticulous restraint of pharmacists is not advocated, but attention is called to the fact that if the unfair competitor is held to the observance of the right standard of his wares he ceases to be an unfair competitor.

Assay of Atropine Sulphate Tablets and Granulation. W. P. Edwards and R. E. Schoetzow.

With the ordinary "shake-out" methods low results are obtained in the assay of atropine sulphate, but using a small definite amount of sodium hydroxide instead of ammonia and with other precautions satisfactory yields of alkaloid are obtained in the assay.

Effect of Acidity on the Activity of Pepsin in the Solid State. W. E. Honsinger, A. L. Dinger and R. E. Schoetzow.

Effect of acidity on the stability of pepsin determined by assaying at intervals a high and low pepsin over a considerable period of time. The low acidity of pepsin keeps the best.

U. S. P. X Nitrate Test on Solution Ferric Chloride. M. W. Carey and R. E. Schoetzow.

Experiment appears to show that a slight positive test may not be due to nitrate. Ferric chloride was made without the use of any nitric acid, yet gave a test for nitrate.

The Assay of Cinchophen Tablets. L. E. Warren.

Very little information concerning solubilities of cinchophen is in the literature. The solubility of cinchophen in a number of substances was approximately determined. There appears to be little choice between alcohol, ether and acetone. Each of these solvents were used to extract the cinchophen from several brands of cinchophen tablets. Absolute ether appears to be the most satisfactory solvent, but alcohol has some advantages. A number of methods for determining cinchophen in tablets were tried. The most accurate method appeared to be extraction of the powdered, dried tablet material with anhydrous ether, evaporation of the solvent, solution of the residue in neutral alcohol and titration of the solution with standard alkali. A short method for the assay of the tablets was evolved. This consists in dissolving the cinchophen from the powdered tablets in hot alcohol, cooling the solution and titrating the acidity without filtrations. A method for estimating cinchophen in presence of other acidic substances by precipitation with silver nitrate was tried. The trials were too few to warrant conclusions, but the results appeared promising.

Diethylphthalate V. (Illustrated by lantern slides.) J. A. Handy and L. F. Hoyt.

The new qualitative test for phthalates, described in our paper, Diethylphthalate IV, has been further investigated. This test depends upon the formation of characteristic needle-like crystals of potassium phthalate when an anhydrous sample containing a phthalate is saponified with alcoholic potash.

A large number of acids, or their esters, have been examined and classified according to the solubility of their potassium salts in absolute ethyl alcohol.

Photomicrographs have been taken of the potassium salts, insoluble in absolute ethyl alcohol, of anisic, anthranilic, benzoic, carbonic, cinnamic, citric, oxalic, phthalic, succinic and tartaric acids and of some of their mixtures. The photomicrographs show that these potassium salts can be readily distinguished under the microscope.

The solubility of potassium phthalate in several alcohols has been determined and a *quantitative* method has been worked out for estimating phthalates in essential oils with satisfactory accuracy.

Limonene Dibrom Nitrosochloride and Derivatives. H. A. Braun and Edward Kremers.

While working in Wallach's laboratory in Goettingen during the academic year 1889-1890, one of the writers had occasion to study limonene hydrochlor nitrosochloride and its derivatives. A few years later, he prepared a small amount of the dibrom nitrosochloride, but had not found the time to investigate this compound for more than thirty years. The study of this substance has been resumed and several nitrolamines, etc., have been prepared.

A Century of the U. S. P., 1820-1920: Aqua Chlori. A. A. Harwood and Edward Kremers.

Tschirch has said: "Die Pharmakopœe ist ein Spiegelbild ihrer Zeit." While this is true in a measure, the inaccuracy of the statement is again proven by the history of chlorine water: the pharmacopœias seem to be invariably far behind the times, chemically speaking.

The substitution of an insoluble metallic chloride in the preparation of so-called extemporaneous chlorine water, the *Liquor Chlori Compositus* of our Pharmacopœia gave rise to a number of interesting observations, the further study of which may throw more light on the general reaction.

$$HClO_3 + 5\,HCl \longrightarrow 3\,Cl_2 + 3\,H_2O$$

and thus may assist in solving some of the difficulties encountered in the preparation of a chlorine solution of required pharmacopœial strength.

Nutritional Value and Standardization of Cod Liver Oil and of Its Non-Saponifiable Fat-Soluble Vitamine Concentrate. Harry E. Dubin.

Attention is called to a recent report from Sweden to the effect that experiments on young animals have shown that cod liver oil is poisonous. To refute this statement, exact experimental evidence of well-known investigators is cited showing the astonishing therapeutic effects obtained with comparatively minute quantities of cod liver oil.

The nutritional value of the non-saponifiable, fat-soluble antirachitic and antiophthalmic vitamine concentrate obtained from cod liver oil is also pointed out.

Methods of standardization are discussed and it is shown that the biological method is to be preferred to the colorimetric method, although the latter has its uses.

The question of suitable dosage is considered and it is concluded that smaller doses than have been the rule heretofore may be used.

Reference is made to the many instances in which cod liver oil concentrate may be used in preference to fresh cod liver oil, and the importance of including the fat-soluble vitamines in the diet at all times is stressed.

Studies of the Vitamin Potency of Cod Liver Oils—XXI. The Stimulation of Reproduction by Fat-Soluble Vitamins. Arthur D. Holmes.

Briefly stated, we fed experimental pens of mature Rhode Island red pullets varying amounts of cod liver oil from November 25th to July 7th inclusive. The experimental pens contained seventy-five birds and oil was fed at the rate of ¼, ½, 1, and 2 cc. per bird per day. We kept a daily weather record consisting of the maximum and minimum temperature, morning humidity, and hours of sunshine. We collected data concerning the egg production, the number of eggs containing blood spots, the fertility and hatchability of the eggs, the viability of chicks, and concerning the adult birds we collected data as to broodiness, mortality and body weight at intervals during the experiment. In brief, we found that cod liver oil increased egg production, fertility, hatchability, and viability of chicks, decreased the number of blood spots, decreased mortality of adult birds, showed little effect on the weight of eggs and broodiness.

The Living Belladonna. Fred B. Kilmer.

The real story of a plant lies in the living structure. If we could interpret that which is recorded in the plant itself, we would have a greater knowledge than has ever been conceived or written down.

In the study of a living drug plant we come to appreciate how different is the market substance from the living thing. The belladonna plant growing wild in its habitat and under cultivation is described. The forms and character of the parts of the plant and their office are delineated. By, and through, its structure, the plant lives, thrives and grows and is—belladonna.

The process of growth and maintenance of life, constituting a continuous round of capture and storage and release of energy is the belladonna at work.

ABSTRACTED AND REPRINTED ARTICLES

OUR DEBT TO PHARMACISTS*

THE American Pharmaceutical Association, which was organized in this city seventy-four years ago, is now carrying on its seventy-fourth annual session at the Bellevue-Stratford Hotel. During these seventy-four years this association has grown to a membership of over 4000, and this 4000 represents the highest type of pharmacists, the men who have an interest in their profession beyond the mere monetary returns. In its ranks will be found the leaders of pharmaceutical thought, the teachers in half a hundred colleges of pharmacy, the editors of two score pharmaceutical journals, the writers of textbooks and the leaders in pharmaceutical organizations, both State and national, throughout the Union.

Pharmacy means very much more than appears on the surface to the casual observer. Back of the hair nets, the soda fountain, the perfumes and the compacts there must be in every pharmacy worthy of the name a basic knowledge of chemistry, of pharmacy, of toxicology and of botany, for on these and allied lines the pharmacist must pass a rigid examination by the State Board of Pharmacy before he is permitted to use the term "pharmacy." In many States he must be a graduate of a recognized school of pharmacy before he is even permitted to present himslf for examination before the State board, and he must likewise have had years of experience under competent instructors before he is allowed to dispense the medicines prescribed by physicians.

Much we owe to these men, who serve the public early and late and have at their fingers' ends the knowledge and skill required to differentiate between noxious and helpful drugs. They must be ever on the alert lest in a moment of absentmindedness the hurtful may be substituted for the helpful drug; they must guard against conscienceless dealers who would foist upon us drugs of inferior quality or strength. They must be able to decipher without error and to prepare with skill the prescriptions which the physician writes. They must

*An editorial from the Philadelphia *Public Ledger*.

forego the temptations which greet them from every side to sacrifice the honor of their calling by the illegal sale of their wares.

It is well, therefore, that the public should be reminded of the service which they render in active co-operation with the medical fraternity in the protection of the public from the effects of disease.

THE NEIGHBORHOOD DRUGGIST *

I ONCE asked a keen observer of human society what profession, to his thinking, combined the most elements of neighborliness. I supposed he would say the ministry, with a second choice on that of the physician. But not at all! He said that the person who had the most points of contact with men, women, young persons and little children in his neighborhood was the "drug store" man.

When there is an illness in the houses of rich and poor he knows it, and from a hot-water bottle to a saline solution he is a factor with the nurse and doctor in every variation of treatment of the case.

When there is a love affair or an emergency in the little houses of the poor all about him, he knows it, for his telephones are used for the discussion of the most private and vital affairs. If a woman wants "aid to beauty" for some end and she will not acknowledge, even to her nearest and dearest, he knows it, whether it be scent or rouge, or lip stick, or hair restorer, or hair eradicator, or hair dye.

If the callow youth of the neighborhood are beginning to admire girls he knows it from the records of his soda fountain, if from nothing else. If a child has an extra penny or the windfall of a dollar, he knows it by the depletion of his candy jars. If there is a letter to be sent by some one to whom the getting or sending of letters is a rare event, he knows it, for he supplies both stationery, stamps and often the blotter and pen. If his neighbors are remembering their friends at Easter, or St. Valentine's Day or Christmas, or on birthdays, he knows it, for his stock of such emblematic missives is handled by the entire clientele.

If servants break a valuable piece of glass or china and wish to put off the evil day of detection of the mishap, he knows it, for his

*Sarah D. Lowrie in the *Philadelphia Evening Ledger*.

advice is asked as to durable cements without a qualm or subterfuge. If a housewife is careful or careless, he knows it, for from camphor balls to roach powder his stock is breathlessly demanded. If there is any skeleton hid behind respectable front doors, he is apt to know it, for no matter how strictly he keeps within the law as to drugs or liquor traffic, the furtive attempts of the brazen or desperate ones to bribe him into a compliance give him all the cues he needs to the drunkards, the drug addicts and the intemperate of all sorts among his clientele.

If there is a fire or a suicide, or a birth, or a death, or an accident, the druggist knows it as soon as the family does. And it is in his shop the rendezvous is made for clandestine love affairs, for family conclaves of a surreptitious sort. It is to his safe-keeping that the keys of the house are temporarily left, and to his kindly sympathy the plans for the outing are confided. He is often the librarian, the water purveyor and the gift shop agent of the district, as well as the bulletin board, the postoffice and the stationer.

He is the master of a science where one-twentieth of a grain counts for life or death, and in his position of father confessor of his neighborhood has a power of imparting common sense and sympathy that a clergyman or teacher or even a doctor may well envy.

It is not a profession where those who follow it honorably are apt to get rich, and the hours of responsible work begin early and last until late in the evening, with Sunday vigilance included. The men who enter it, therefore, must do it from a real aptitude for its exacting and skillful practice and for some quality of temper and mind that makes the constant call on their patience and helpfulness and kindly experience a congenial and gracious task.

MEDICAL AND PHARMACEUTICAL NOTES

More Powerful Than Quinine.—Perkins, the English chemist, in his search for synthetic quinine, accidentally discovered the first anilin color. The search for synthetic quinine has continued ever since, but ineffectively. Now comes from Germany announcement of the discovery of a new compound, not truly synthetic quinine, but another far superior anti-malarial.

Malaria, the most obstinate of the tropical diseases in its resistance to the advance of modern medicine, is to have its hold broken at last by this synthetic drug resembling quinine but much more powerful, produced in the laboratories of the Elberfelder Farbenfabriken. The discovery created a sensation when it was announced at the meeting of the Association of German Natural Scientists and Physicians at their recent convention in Dusseldorf, and it was declared that it has a significance comparable to that of Bayer 205, the remedy for African sleeping sickness, which converts vast areas hitherto plague-stricken into potential homes for men.

Quinine, for centuries the only known specific for malaria and still the standard remedy, does not wholly conquer the disease, especially some tropical forms of it. It is quickly fatal to certain of the malarial parasites, but other strains of the microbes resist it. The new remedy, which has been christened "Plasmochin," wipes them all out impartially. It is thus regarded as a complete cure, in contrast to the merely partial effectiveness of the extract of natural cinchona bark. Physicians say that there is now hope of killing off malaria germs until they are as extinct as the dinosaur and the dodo, simply by clearing up the blood of all malaria patients until there are no more of the dreaded microbes for the Anopheles mosquito to carry. Exactly the same sort of thing has been done with yellow fever, they point out, and that without a specific curative drug with which the physician might help the sanitarian. With plasmochin the conquest of malaria should be easier than that of "yellow jack," in spite of the wider incidence of the former malady.

The new remedy is said to be easier to take than quinine, because it has no bitter taste. Heavy doses are sometimes followed by cyano-

sis or blueness of the skin, but this is of brief duration. Upsetting of the stomach rarely occurs, and the patient's blood cells are not attacked.

The discovery of plasmochin was not a matter of lucky chance, but the result of a deliberately planned campaign of chemical and biological research. Not one preparation, but several, in a series of increasing potency, were sought.

The exact chemical structure of plasmochin was not revealed. It was frankly stated in the meeting that the discoverers feared that their work might be pirated and exploited by outsiders.

According to preliminary information, this new synthetic anti-malarial remedy was discovered by a pupil of Professor Paul Ehrlich, and was first tested by him on birds infected with malaria. The results were so remarkable that it was tried extensively on human beings in the Balkans by Professor Muehlens, and also in Italy and Spain. From these observations it appears that plasmochin is ten times more powerful than quinine and is effective in doses as small as one-third gr. (0.02 gm.). It has a much more destructive effect upon the plasmodium, so that recurrences are less frequent than with quinine. It exerts an almost specific action upon the gametes of pernicious malarial fever. There is no reduction of effect during continued use and hypersensitiveness or idiosyncrasy has not been noted. It can also be given in cases of blackwater fever, in which quinine is ordinarily contraindicated. Plasmochin has a further advantage over quinine in being tasteless.

Storage of Hydrogen Peroxide.—Aluminium containers have been strongly recommended for storing hydrogen peroxide solutions. It is claimed to be absolutely impassive, and is therefore being used as construction material for distilling apparatus as well as for tank cars transporting hydrogen peroxide. Besides aluminium, containers made of quartz glass are recommended. Since perfectly pure and neutral hydrogen peroxide free of acid is decomposed by very small traces of alkali, paraffin linings are employed for the glass containers used for holding the 30 per cent. solution. Although in general the hydrogen peroxide manufactured today is much purer than the qualities pro-

duced some ten years ago, preservatives are usually employed to increase the stability of the solution. Very good results are being obtained with small amounts of acids, particularly phosphoric acid. Alcohol has been used with decided success, but after prolonged storing the peroxide develops a peculiar smell, thus making the use of this preservative impossible for most purposes. Very good results are claimed to have been obtained with strontium hydrate, of which 0.2 per cent. suffices to protect hydrogen peroxide solutions against decomposition at as high a temperature as 70 degrees C. Similar results are said to be achieved with 0.2 per cent. of grape sugar. Other preserving agents are agar-agar, starch, tragacanth, *p*-acetylaminophenol, aniline, acetanilide, phenacetin, and cinchonidine, etc., most of which have been or still are patented. Some of these are of rather questionable value, whilst others, for instance, acetanilide and phenacetin, are giving very good results.—Dr. Wetring (*Continental Metall. and Chem. Eng.*, August, 1926, through *Chem. Trade Journ.*, August 27, 1926, 252), through *Pharm. Jour.*

YOCCO, A NEW CAFFEINE-CONTAINING DRUG.—This drug was known only from some information given by the explorer Dr. Bayon, who came across it in Colombia in 1904. Last year Filaés found it to be used by the Corroguja Indians in Caqueta, Colombia. It is fairly plentiful in that region in a wild state, and is also cultivated by the natives, who always keep a supply of it in their huts and canoes. The parts used to make an infusion are the bark and twigs. This is scraped to remove the thin warty outer portion; thus cleaned it is cut up in small pieces and macerated in water. The infusion is then drunk the first thing in the morning, to relieve fatigue, assuage hunger, and enable the partaker to undertake long journeys and hunting expeditions. The specimens of Yocco sent to Europe for examination consisted of twigs of a mean diameter of 4 cm.; with a greyish surface bearing scattered warty prominences. The bark is thus not more than 0.5 cm. thick, the woody portion compact, and the pith very small. Microscopic examination reveals numerous laticiferous vessels, and many prismatic crystals of CaC_2O_4. The crystalline organic constituents was identified as caffeine; the highest yield of which,

2.73 per cent., was obtained by extracting the material with water acidified with 2 per cent. of HCl. The botanical source of Yocco is not stated.—E. Perrot and A. Roupier (*Comptes rend.*), 1926, 182, 1494, through *Pharm. Jour.*

Lead Poisoning Through Food Supplies.—Reminiscent of the days of chrome yellow in cakes is the following news item from Bulgaria:

An outbreak of lead poisoning at Vidin, Bulgaria, affecting over 300 people, has just been reported to French medical circles. The poison was finally traced to the sweet red pepper that puts the kick into goulash, so beloved of the Balkans, which an enterprising firm had adulterated with red lead oxide.

Several deaths ensued before the cause of the mysterious malady was located. According to medical authorities, the large number of cases puts the epidemic in the class with other instances of lead poisoning famous in history. One of the most noteworthy of such epidemics took place two hundred years ago at Versailles, when the royal household was poisoned by water which had dissolved some of the dangerous metal from the lead pipes of eighteenth century plumbing. Still more recently, certain unscrupulous Philadelphia bakers replaced the eggs in angel cake with lead chromate (chrome yellow) and many good Philadelphians accordingly perished.

Mosquito Repellants.—C. W. O. Bunker and A. D. Hirschfelder report in the *American Journal of Tropical Medicine,* (Vol. 5, No. 5, 1925), on an extended investigation of the repellant action of numerous chemical agents in the control of mosquitoes. The rank suggested for those that have had enough tests to justify comparison is as follows: Citronellol, caprylic alcohol, benzyl alcohol, geranyl acetate, linalyl acetate, amyl salicylate, acetophenone, oleum picis liquidae rectificatum, phenyl-propyl alcohol, olive oil, citronellal, camphor, vanillin, methyl cinnamate, menthol, cedarwood oil, citral coumarin, B-naphthol-ethyl ether, and geraniol.

NEWS ITEMS AND PERSONAL NOTES

Plan Adopted for Selecting Site for Pharmacy Building.

A. That a vote on location be authorized.

B. That publicity be given to this in the October, 1926, issues of the *Pharmaceutical Journals* with the request that interested cities forward a statement of their respective advantages and offers to the Secretary of the Association on or before January 15, 1927.

C. That a letter summarizing these statements and a first ballot be mailed to each member of the Association on February 15, 1927, with a statement that only those ballots received by the Secretary of the Association on or before March 15, 1927, will be counted.

D. That the five cities receiving the greater number of votes in the preceding ballot are to be balloted on again in the same manner on April 1, 1927, only those votes received by the Secretary of the Association on or before May 1, 1927, to be counted. The two cities receiving the greater number of votes in the preceding ballot are to be balloted on again in the same manner on June 1, 1927, only those votes received by the Secretary of the Association on or before July 1, 1927, to be counted. The city receiving the greater number of votes in this ballot shall be the location of the Headquarters Building.

E. After the location of the Headquarters Building is determined the national pharmaceutical associations should be invited to avail themselves of the opportunity to occupy space in the building and that plans for the building be prepared in accordance.

Research on Surgical Supplies.—According to Dr. E. R. Weidlein, Director, Mellon Institute of Industrial Research, University of Pittsburgh, the firm of Johnson & Johnson, manufacturer of

surgical supplies, New Brunswick, N. J., has established at the institute a Fellowship that will study the exact requirements of surgeons and other medical specialists in the way of sundries, with the joint aim of developing new supplies that are needed and of standardizing the products now in use. An investigation will also be made of the processes of renovating used supplies, and several other Industrial Fellowships of the Institute will coöperate in devising satisfactory procedures.

Dr. Frederic H. Slayton (M. D., Rush Medical College) will be in direct charge of this comprehensive research. The Fellowship will be operated in a totally unbiased and independent manner, in accordance with the Mellon Institute system, and all its investigations will be conducted primarily for the benefit of the public. It is the plan to report the results in appropriate periodicals as the various phases of the studies are concluded.

In carrying on this work, Dr. Slayton and the Institute's Executive Staff invite the concurrence of all interested organizations. They are especially desirous of securing the close collaboration of hospital executives and of members of the medical profession.

A. Ph. A. Visits Mulford Laboratories.—One of the pleasant events in connection with the Seventy-fourth Annual Convention of the American Pharmaceutical Association, recently held in Philadelphia, occurred on the afternoon of September 16th, when about 350 members and friends of the Association were given an opportunity to visit the Mulford Biological Laboratories, at Glenolden, Pa.

The members were the guests of the H. K. Mulford Company, in the fullest sense of the word. Transportation was provided by special motor busses from the hotel door to Glenolden and return. The line of travel led through part of the busiest shopping district in Philadelphia, then past the Philadelphia Wholesale Drug Company, the Mulford Pharmaceutical Laboratories (which cover ten acres of floor space under one roof), the Philadelphia Mint, the new Philadelphia Art Museum, through beautiful Fairmount Park, past the Zoological Gardens, and, finally, the site where the new million dollar home of the Philadelphia College of Pharmacy and Science will be erected.

Upon arrival at Glenolden, the official Convention photograph was taken, and then the members availed themselves of the invitation to visit various points of interest about the Mulford Laboratories, which cover some 200 acres of land and comprise over fifty buildings.

Various processes were shown in operation, such as bleeding of horses and many other forms of laboratory work as conducted in connection with the production of antitoxins, serums, vaccines, etc. But the two points which probably attracted the greatest share of attention were the botanical gardens, as conducted on the Mulford Farms jointly by the Philadelphia College of Pharmacy and the H. K. Mulford Company staff, and the collection of snakes, as used in connection with the Anti-Venine Institute of America, which is a recent addition to the activities of the Mulford Laboratories.

Baseball and other sports were indulged in by some, and at six o'clock a supper was served to all present, followed by dancing in the evening.

Finally, after a strenuous day, every one was taken back to the hotel by bus. The comments heard on all sides indicated that the visit had proved pleasant and instructive all around, and thanks were extended to the H. K. Mulford Company for their hospitality.

BOOK REVIEWS

Die Wachse und Wachskörper. By Dr. Carl Lüdecke. Volume 7 of the series of monographs in the field of fat-chemistry, edited by Prof. Dr. K. H. Bauer. 8vo., 161 pages, paper bound, 12 mks. Wissenschaftliche Verlagsgesellschaft m. b. H. Stuttgart.

This work is adapted to the uses of all who are concerned with the important department of waxes. It presents in detail the data of the occurrence and obtaining of the waxes, with information as to the composition, preparation, applications and testing of the raw materials. The title has been chosen advisedly, as the author did not desire to limit the work strictly to the true waxes, but to include analogous substances such as a Japan wax which has only certain resemblances to the group. The work, therefore, offers to all those dealing with waxes and wax-like substances a comprehensive treatise in the applications of these in industrial fields as well as in pharmaceutic and cosmetic. It is assumed that the industries in this field are usually of limited scope, although they have gradually expanded but not rapidly from the chemical side. The preparation of materials has not been alone considered in the more extended operations but also the adulterations to which they are liable, the detection and elimination of these also. The book is the best account of the general character of waxes and wax-like substance yet in print, and is a valuable contribution to a field of much importance. It is printed in clear Roman type on good paper. In the chapter on the "Application of Waxes and Wax-like Substances" the author shows his wide knowledge of the subject on which he has written.

H. L.